Welding Engineer

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MAY 1956

Welding Show Issue

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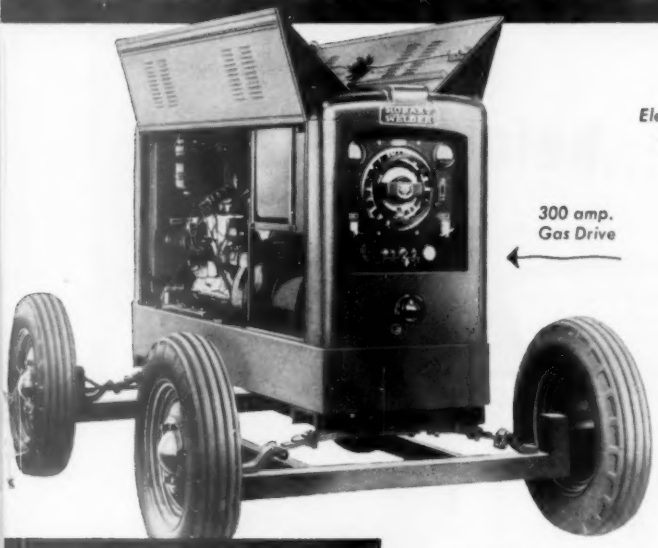
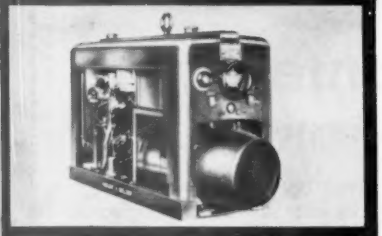
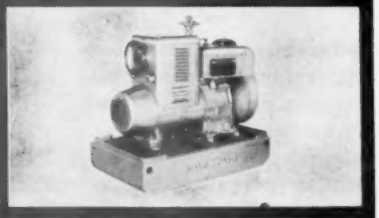
1-18

HOBART ARC WELDERS

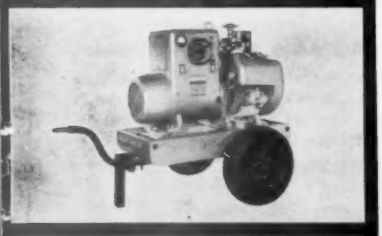




250 amp. "Pipeliner"



200 amp. "Husky Boy"



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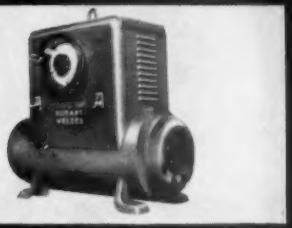
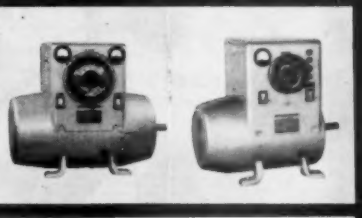
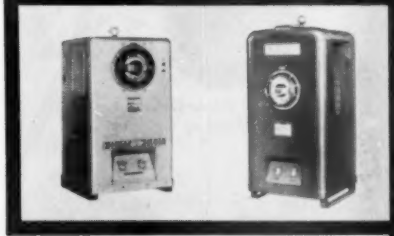


250 amp. "Bantam Champ"



200 amp. D.C. 200 amp. AC-AC



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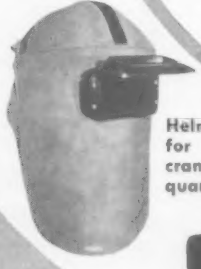

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for
cramped
quarters

Fiber Spectacle

CESCO

C E S C O

FOR SAFETY

Welding Engineer

MAY, 1956
VOL. 41—No. 5

THE MAGAZINE OF JOINING
AND SEVERING OF MATERIALS

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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TED B. JEFFERSON
Editor and Publisher

•

FELIX T. TANCULA
Executive Editor

•

JACK FAIRLIE
Associate Editor
AUDREY L. MADSEN
Assistant Editor
B. M. BRITE
Editorial Assistant

•

PATRICE L. SIMPSON, *Production*

•

JIM BREWSTER, *Circulation*

•

WARREN WARE
Western District Manager
12 E. Grand Ave., Chicago 11, Ill.
Telephone: DElaware 7-0339

•

HERMAN PHELPS
Eastern District Manager
P. O. Box 128, White Plains, N. Y.
Telephone: WHite Plains 9-3876

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Medium-class holder, model A-W, 14 ounces, lightest holder made to take 1/4" rods, rated 300 amps, with its long lever, and fitting the hand like a glove, is the most popular in the Jackson line.

Large class model A-5S, 21 ounces, takes 5/16" rods at 400 amps, has wider lower tong for firm grip, larger diameter handle.

QUALITY PRODUCTS

Aluminum alloy tongs for lightness, and high-copper alloy jaws for durability, account for the year-after-year popularity of Jackson Featherlight Electrode Holders. Up to 35% less in weight, they not only give excellent, but tireless performance. With Jackson's high-impact, high-heat resistant insulation, they also give you long trouble-free service, easy low-cost maintenance.

JACKSON *Featherlight*

Medium-class streamlined model JH-3, 15-3/4 ounces, takes 1/4" rods into the tight spots at 300 amperes.

Small-class model JH-2, 9-1/2 ounces and only 8" long (Jackson's smallest) takes 5/32" rods at 200 amps.

Sold World-Wide—through Distributors and Dealers

JACKSON PRODUCTS, INC • WARREN, MICHIGAN

WEATHER won't stop football practice of the Ohio State Buckeyes. Shown here in early stages of construction, is welded steel framework of an indoor practice arena for Ohio State University. (See story below.)

EXHIBITOR at the recent Southern Safety Congress in Atlanta was C. D. Genter Co., Chattanooga, Tenn., safety-clothing manufacturer. Shown in display booth are, left to right, Elmo Brookshire, Joe Payne, Larry Lowe and E. M. Heider. Picture was taken by George Tepley, also of Genter. About 6,000 safety engineers registered for meeting, conducted at the Biltmore Hotel. Approximately 45 companies exhibited.

News

Sunny clime comes to football

Baseball may continue to go south for practice but football teams of Ohio State University, Columbus, will be able to practice in a sunny clime all year round. Nearing completion on the campus is a huge indoor practice arena.

The building is a welded rigid frame steel structure, 200 by 400 ft. It consists of 18 all-welded rigid frames. Welded construction was selected because it was felt it afforded the best answer to providing a clean simple design with the greatest economy.

—*The Lincoln Electric Co.*

Eutectic opens welding institute in Canada

The first class of the Eutectic Welding Institute of Canada will meet May 14-18 at the new plant of Eutectic Welding Alloys Co. of Canada, Ltd., Montreal.

The institute will operate on a non-profit basis. Each class will provide a minimum of 30 hours of instruction and bench practice in torch and arc welding. Modern metal joining and repairing methods and alloys will be studied for improved welding.

Training will be given in wear, corrosion and impact resistant overlays. Latest teaching methods will be employed, including films. Oral instruction will be in both English and French. Each graduating student will be awarded a diploma.

Fabricating firm formed in Canada

A new company, T.I.W. Western Ltd., has been formed by The Canadian Kellogg Co., Ltd., and Toronto Iron Works, Ltd. The new firm is part of an expanding program to increase fabricating services to western Canada.

T.I.W. Western incorporates the former Canadian Kellogg manufacturing shops in Edmonton, Alberta. It will fabricate storage tanks, steel and alloy-steel plate products and specialized equipment.

Thor Power plans new plant

Construction of a new manufacturing plant will begin soon for the SpeedWay Mfg. Co., a division of Thor Power Tool Co., Aurora, Ill. The plant will be erected on a 15-acre site at LaGrange Park, Ill. Occupancy is slated for early next year.

M & T acquires the Glenn Co.

As another step in its current expansion program, Metal & Thermit Corp., New York City, has acquired the Glenn Co., Oakland, Calif. Glenn is a manufacturer of constant-voltage power sources, welding wire feeding devices and other products.

The firm will remove to new quarters at 703 37th Ave., Oakland, where it will operate as a manufacturing subsidiary under the name of M & T Welding Products Corp.

It is expected that applications for the constant voltage power sources, manufactured by Glenn, will be developed in the electroplating, metallurgical and electronics industries as well as in welding.

Officers of the newly formed M & T Welding Products Corp. are: H. E. Martin, president; G. G. Glenn, E. E. Anderson and J. L. Oberg, vice-presidents; J. F. Condon, secretary, and C. J. Beasley, treasurer.

Norton Co. enters Argentine market

Norton Co., Worcester, Mass., has acquired controlling interest in a sandpaper plant in Argentina. Located in downtown Buenos Aires, the firm is known as C.A.L.E. (Compania Argentina de Lijas y Esmeriles). It is one of the two leading manufacturers in Argentina of abrasive papers and cloths.

Present management will be retained. The move marks entry of Norton Co. into the Argentine market closed during the Peron regime.

News

from page 5

VOLUME Sweepstakes award is held by Mrs. J. T. Wolfenden, Sr. (center.) Others are (left to right): Bill Howell, manager of distributor sales for Hobart Bros. Co.; John T. Wolfenden, Jr.; Bill Wolfenden, and Dick Sherwood, territorial manager for Hobart Bros. (See story below.)

MANAGER of the electrode division of Marquette Mfg. Co., Dr. F. W. Scott, (left) allows C. M. Clogston, chairman of AWS Northwest section, to try his hand in electrode-coating, concentricity-testing device. A. P. Demmer, Air Reduction Sales Co., watches. Marquette Mfg. was host to the section at a recent plant tour.

Wolfenden Welding wins Hobart sales award

Wolfenden Welding Supplies, Inc., Cleveland, has received the 1955 sales volume award in a distributor competition sponsored by Hobart Bros. Co., Troy, Ohio.

Wolfenden Welding, finishing in first place in the Volume Sweepstakes for 1955, was cited for its outstanding work in building sales for welding equipment, electrodes and accessories.

Second place went to Hobart Welding Accessories, Inc., Long Island City, N. Y., and third to H. K. Miller, Inc., Chicago.

Wolfenden is owned jointly by Mrs. J. T. Wolfenden, Sr., and her two sons, John T., Jr., who manages Cleveland sales, and Bill, who manages a company branch in Canton, Ohio.

The firm was established by the late John T. Wolfenden, Sr., in 1935. In 1944 the business was moved to 3500 Prospect Ave. in Cleveland and today is located in a new modern building at this address.

Sylvania plans nuclear expansion

A multi-million dollar expansion program in the nuclear power field will be undertaken by Sylvania Electric Products Inc., New York City. The first step of the program, to extend over the next five years, will be new production and development facilities for nuclear fuels and components.

A new production plant and laboratory will be constructed on a site on the East coast. The exact location has not yet been determined.

Norton Co. holds open house

To mark the formal opening of its new Santa Clara, Calif., plant, Norton Co., Worcester, Mass., will hold an open house, May 7-9.

The plant, located at 2555 Lafayette St., was purchased in 1954. Conversion for grinding wheel manufacture was started last year.

Duluth builders elect new president

The Duluth Builders Exchange, Duluth, Minn., recently elected R. S. Mars, Jr., to the presidency. Mr. Mars is vice-president of W. P. & R. S. Mars Co., of that city. (For further news of Mr. Mars, see the report on the recent NWSA convention in this issue.)

The Exchange is composed of contractors, material suppliers, equipment distributors, financial institutions, interested in the construction industry. The exchange covers an area including northern Minnesota, northern Wisconsin and the upper peninsula of Michigan.

The group, under Mr. Mars' leadership, plans to incorporate sales training and discussion into its program for the coming year.

Mason-Neilan joins Worthington Corp.

Worthington Corp., New York City, and Mason-Neilan Regulator Co., Boston, have merged. The Mason-Neilan plant and facilities will operate as the Mason-Neilan Division of Worthington. No change in personnel is planned.

The merger unites two manufacturers in complementary fields. Mason-Neilan produces control valves and regulators. Worthington manufactures pumps and pumping machinery, air and gas compressors, welding equipment.

The full line of Mason-Neilan products will continue to be manufactured. A new manufacturing plant recently acquired in Norwood, Mass., will soon become the site of the new division's operations.

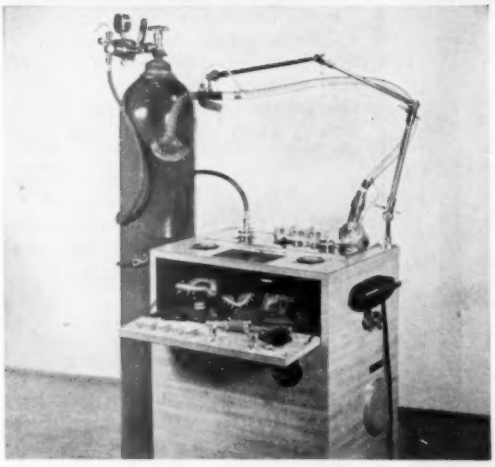
Gasflux Co. in larger quarters

The Gasflux Co. has moved its plant, general offices and principal sales office to larger quarters at 141 N. Logan St., Elyria, Ohio. Gasflux Co. was formerly located in Mansfield, Ohio.

Industrial exhibit at Bluefield, W. Va.

Automation in mining will be a theme of the Southern Appalachian Industrial Exhibit to be held May 23,

(Continued on page 129)



The Bennett Pressure Breathing Unit—a complete hospital resuscitator and respirator—regulator by NATIONAL of California.

Continuously adequate respiration is vital to life and recovery — that is why various Bennett Pressure Breathing Units are equipped with regulators made by NATIONAL of California.

The Bennett Valve, originally designed for aviation high altitude research, is the heart of all Bennett Pressure Breathing Units. This valve is a unique flow-sensitive mechanism which permits the patient to actuate the unit in his own natural breathing pattern; or—to be resuscitated automatically if his breathing falters or stops. Various Bennett Pressure Breathing Units are manufactured by V. RAY BENNETT AND ASSOCIATES, INC.—because the very best and most dependable pressure regulators are vital in such life-sustaining units, this fine and experienced manufacturer has standardized on the dependable regulators made by NATIONAL of California.

The dependability, the long life and pressure accuracy of these regulators have made them the choice of the vast majority of all life-saving equipment manufacturers and these, also, are the soundest reasons why anyone employing cylinder gases in the welding industry will receive maximum satisfaction from these internationally known products.

National of . . . california

We cordially invite you to write today — for free copy of a beautifully illustrated, 44 page brochure.

547 DEPT.

NATIONAL welding equipment company... 218 fremont street san francisco 5 california

Best quality ★ chisel steel
Unbreakable ★ steel shaft
★ Head silver brazed to shaft
★ Metal or wood grips
Model H Cone and Chisel one of 27 models

WHATEVER STYLE TOMAHAWK YOU BUY FOR YOUR JOB - BE SURE ITS ATLAS QUALITY

B-1 "Re-Bit" Dual Tool 10½" 16 oz.
B1-W "Re-Bit" Dual Tool 10½" 15 oz.
Model A Dual Tool 10½" 17 oz.
Model AW Dual Tool 10½" 16 oz.
Model E-1 "Re-Bit" 9" 12 oz.
Model E1-W "Re-Bit" 9" 10 oz.
Model F-1 "Re-Bit" 10" 16 oz.
Model F1W "Re-Bit" 10" 14 oz.
Model G Chisel & X-Chisel 9" 14 oz.
H-9" 14 oz. L-10" 17 oz. Cone & Chisel
Model I Chisel & X-Chisel 9" 13 oz.
J-9" 13 oz. N-10" 15 oz. Cone & Chisel
LCP-10" 17 oz. HCP-9" 14 oz. Cone & X-Chisel
Model K Cone & X-Chisel 10" 17 oz.
JCP-9" 13 oz. NCP-10" 15 oz. Cone & X-Chisel
Model M Chisel & X-Chisel 10" 15 oz.
Models WH: 10-20-30 12" 14 oz.
Model C "Re-Bit" Chisel & symbol
Model CW "Re-Bit" Chisel & symbol
Models OCC—OCP—ODC 9½" 10 oz.

You Can't Beat ATLAS Quality

The modern Atlas plant is devoted exclusively to building the finest weld cleaning tools in America. There are models to suit the man and every type work. If you haven't tried Atlas you don't know what a difference "balance and feel" can make in production and quality of work. They can take it.

ATLAS WELDING ACCESSORIES INC.

707 E. LEWISTON AVENUE, FERNDALE 20 (DETROIT) MICH.

Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if requested.

Voice from Down-under

Dear Sir:

Let me offer you our congratulations on your excellent magazine. Its contents are of utmost interest and always topical.

As manufacturers of steel weldments for the steel industry here in Australia, we quite often make use of the information we receive from your articles.

R. K. Pinna
West Footscray, Australia

Welding stainless steel

Dear Sir:

I am a recent subscriber to WELDING ENGINEER and I take this opportunity to let you know I am very pleased with the information I receive from its pages.

In the near future I shall be getting into stainless steel welding. Although I have some experience with it, I would like to know more about welding heavier stainless steel plate. I'll be working mostly with the 316 type stainless.

George Turco
Beacon, N. Y.

—Helpful data in the form of reprints from WELDING ENGINEER were sent to Mr. Turco.

Stored energy

Dear Sir:

I cannot help but take exception to statements in the March welding clinic regarding stored energy for resistance welding. I believe some of the reasons as to why stored energy has become important as a power source in resistance welding are incorrect and misleading.

Particular exception is taken to paragraph 6: "The Only Answer." The second sentence states ". . . stored energy is the only possible remedy." To the best of my knowledge, no stored energy machines have been built in the

last five years and they are now almost out of the picture, as far as commercial usage is concerned.

The principal reason for stored energy machines in the first place was that control of these machines seemed to iron out some of the difficulties in the earlier days of aluminum welding. These machines were widely used during the second world war, not because of their low power demand, but because of their ability to provide a higher quality aluminum weld.

Since that time, direct-energy, three-phase machines and direct-energy, single-phase machines, have been developed that can essentially duplicate any weld that can be made with the stored energy machine.

Another misleading statement is intimating that one or two direct energy machines could be tolerated in a single installation, but when several machines are used it becomes unbearable. Actually the opposite is true.

The biggest offender on direct energy machines is use of a single large machine in a given locality. As more of these machines are added to the line a diversity factor enters, leveling off the demand.

Therefore, the more machines in a given installation, the less objectionable either a three-phase, direct-energy or single-phase, direct-energy machine becomes.

While it is true that large kva machines often interfere with normal power supply, this is actually a matter to be determined for each installation. In certain locations, on any large power system, large, single-phase, direct-energy machines can be installed without any difficulty. In other locations on the same system considerably smaller machines would be refused by the power company.

E. J. Del Vecchio
Swift Electric Welder Co.

Repairing a repair

Dear Sir:

Here's a king size weldor's woe.

Have you ever handled a repair job someone else has tried—without determining what sort of metal is involved? For instance, a job involving a manganese girth gear, 8 ft in diameter with a 14-in. face, the lightest section 2½ in. thick at the web? Or, to discover, once into a tube mill discharge plate to close up the openings in what is laughingly called just "chrome moly"—no number on it, no one knows what sort of alloy it is, with regard to percentage of chrome, etc?

To some of us who have given over years to the trade (I have 15, ten in the maintenance field) the advancement

New AMPCO-BRāZ #1 —a "3-in-1" Filler Rod

for

- *silver-like, high-strength joints*
- *low-friction overlays with good bearing qualities*
- *corrosion and wear resistance*

Here's a non-fuming, low-melting-point rod that gives you attractive welds with high strength. Ampco-Brāz #1 has a special "controlled" composition that permits both joining and overlay with the oxy-acetylene process.

A wide variety of copper-base, iron- and nickel-base metals and alloys can be joined with this new copper-alloy filler rod. It produces strong, silver-like welds of 85,000 p.s.i. tensile strength with 160,000 p.s.i. shear strength—in bevelled-butt, fillet, and straight-butt joints. There's no warpage or distortion. Ampco-Brāz #1 is excellent for tough overlays, too, because it resists corrosion and wear.

Ampco-Brāz #1 is ideal for all-position welding, and is easy to apply — uses ordinary brazing fluxes and techniques. It goes on rapidly at low cost because a larger flame can be used without "burning" the alloy. A low bonding temperature and low melting point results in smooth, dense, free-flowing deposits.

Order new Ampco-Brāz #1 from your nearby Ampco distributor or write us for more information.

*Reg. U. S. Pat. Off.

AMPCO
The Metal without an Equal

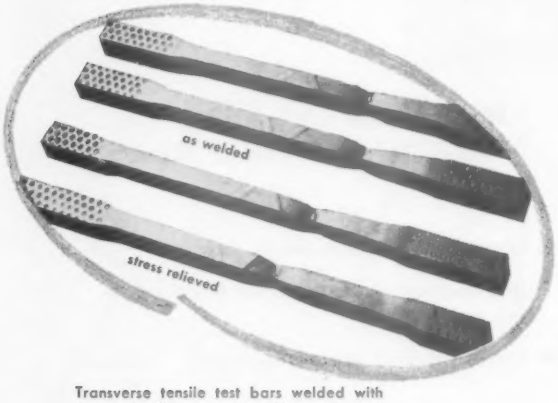
AMPCO METAL, INC.
Dept. WE-3 • Milwaukee 46, Wisconsin
West Coast Plant • Burbank, California

W-138

NEW ATOM•ARC 'T'

IRON POWDER LOW HYDROGEN ELECTRODES

for welding Carilloy "T1" Steel



Transverse tensile test bars welded with Atom • Arc "T" electrodes. Notice that all breaks occurred in the base metal.

Notice the ductile fracture in these all weld metal Charpy V notch impact bars broken at —65° F.

VISIT OUR BOOTH #79
at WELDING SHOW
MEMORIAL AUDITORIUM
Buffalo, N.Y.
May 9-12, '56

Here's the answer to dependable, economical high strength welds on Carilloy "T1" Steel

100% Joint Efficiency

Developed especially for the welding of "T-1" steel, the outstanding physical properties of Atom • Arc "T" provide 100% joint efficiency in the "as welded" or "stress relieved" condition.

Excellent Ductility

Ductility and impact values are excellent at low temperatures. Charpy V notch impact values of 29 ft. pounds at —65° F. "as welded", 23 ft. pounds at —65° F. "stress relieved". All breaks under impact show excellent ductility.

Plus

Atom • Arc "T" offers these outstanding plus values for which every Atom • Arc electrode is widely known . . .

X-Ray quality crack-free welds
Easy operation
Faster deposition rates
Low spatter loss—quick, easy clean-up
Smooth uniform weld beads in all positions.

Free Data Sheet

Write today for complete information on welding Carilloy "T-1" steel with Atom • Arc "T" electrodes.

Alloy Rods Co.

General Offices and Plant—Lincoln Highway West
YORK 2, PENNSYLVANIA

Pacific Coast Sales Offices and Plant—750 Lairport Street
EL SEGUNDO, CALIF.

no finer electrodes made . . . anywhere

NOTE: Carilloy "T-1" is a registered trademark of the United States Steel Corporation.

When ordering Welding, Cutting or Safety Equipment

Specify **BURDOX**

BURDOX *has the right product for* **BURDOX** *has them all*

INDUSTRIAL GASES ✓

GAS WELDING EQUIPMENT ✓

ARC WELDING EQUIPMENT ✓

SAFETY EQUIPMENT ✓

CUTTING EQUIPMENT ✓

ACCESSORIES ✓

And because Burdox has them ALL, you make the most of your time and money. The opportunity to choose the least costly, highest quality and most adaptable process or product is yours when you call BURDOX, since BURDOX has the right equipment for every job. When you have a welding job to be done, you are confronted with the questions of HOW to use WHAT product WHEN . . . a call to BURDOX gives you the answers. BURDOX engineers are expert welding men who will give you the benefit of their years of experience. Write for your FREE catalogue NOW!

THE BURDETT OXYGEN COMPANY

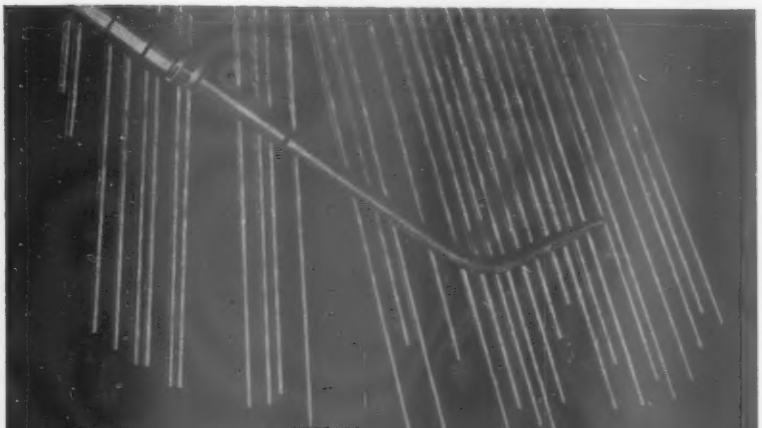
3302 Lakeside Ave. • Cleveland 14, Ohio

PLANTS: Cleveland, Dayton, Findlay, Mansfield
Youngstown, Ohio and Los Angeles, California
BRANCHES: Akron, Cincinnati, Columbus, Ohio

EVERY PRODUCT FOR EVERY PROCESS TO DO YOUR JOB BEST

Burdox Quality

BEAVER



in repair welding...
in production welding...
only **bronze**
offers all of these advantages

■ **can be applied to a wide range of materials**

Mild Steel • High and Low Carbon Steel • Cast Steel • Wrought Iron • Brass • Bronze • Copper • Grey Iron • Malleable Iron Castings.
Chrome and Nickel Cast Irons and many others

■ **easily and quickly applied**

Uniform and Easy Tinning.
Pre-heating or post-heating for stress relief are not necessary.
Low melting point.
Pre-cleaning can be eliminated with certain types of rods.
Bronze welds are easily machined.

■ **bronze welds are dependable in service**

Superior bonding properties • High strength • Excellent wear resistance • Corrosion resistant.

TITAN Bronze Welding Rods are supplied in several types to meet every requirement for oxy-acetylene welding. All are carefully deoxidized to assure ductile, high-strength, non-porous welds. Our general purpose rods are Double-Deoxidized by a patented process.

● *Write Dept. T-67 for complete information*

Quality Alloys by Brass Specialists
BRASS and BRONZE ROD • FORGINGS • DIE CASTINGS
WELDING RODS • WIRE

Titan® METAL MANUFACTURING CO.

Offices and Agencies in Principal Cities | General Offices and Plants: Bellefonte, Pa.
ROD MILL DEPOTS: Bellefonte, Pa., Indianapolis, Ind.

of good welding is the aim and mainstay of our endeavors. The challenge of everyday welding is our lifeblood and versatility our tool.

To others, unfortunately, indifference seems to be the keynote—operators and supervisors alike. The disgust a weldor feels when he gets an indifferent "hen track" repair weld to re-repair can be well-imagined!

Is there any reason a manufacturer of a particular piece of equipment couldn't include, in the parts catalog or maintenance manual, a list designating the SAE number of material used or a least a recommendation as to weldability and/or the electrodes to use?

How about a repair weldor's manual giving a simple method of testing that the little guy behind the mask could use? His facilities are limited to a very few items: a magnet, cutting torch and a bit of common sense.

John Itkonen
Harrison, Mont.

Oxypropane cutting

Dear Sir:

I read with interest the article, "Comparative testing confirms oxypropane cutting value," by Jay Bland in your February issue. We manufacture apparatus for the efficient use of oxygen and propane but feel that the virtues of the oxyacetylene flame far surpass propane.

I personally would like to see a follow-up article written by qualified experts giving the facts and a cost comparison of oxyacetylene versus oxypropane, with both equipments tested under field conditions.

Karl H. Schmuldt
K-G Equipment Co., Inc.

Electrode data

Dear Sir:

I just had a copy of WELDING ENGINEER passed on to me. I think it is a grand magazine and hope you can tell me where I can obtain the following data: American Welding Society electrode classifications, welding symbols and National Electrical Manufacturers Association color identification of electrodes.

Edward D. Johnson
Troy, N. Y.

—Our latest electrode classification chart, published in October, 1955, and other information, was forwarded to Mr. Johnson.

IT TAKES money to grow—steel companies are scheduled to spend a record $1.2 billion for expansion and improvement during 1956. They spent a total of $7 billion for the purpose in 1946-55 inclusive.

50 passes of Ni-Rod "55" Electrodes

. . . and a broken lift truck returns to work!

A big eastern lumberyard was in trouble when it suddenly lost the services of a $9000 lift truck.

The 1500 lb. iron fender that acted as a counterweight for the truck broke right through a bolt hole . . . where the metal was two inches thick.

Cost of a new fender would be more than $800 . . . with delivery two months away. So the lumberyard decided to try welding. They turned the damaged fender over to Iron Works, Incorporated, Brooklyn, N. Y.

After heating the damaged area to about 80°F., a weldor began welding the broken piece to the casting. About 50 passes later . . . between 4 and 5 lbs. of Ni-Rod "55"* electrodes . . . the repair was made. Made soundly.

Time? *Only a day and a half!*

Why do weldors prefer Ni-Rod "55" electrodes for repairing heavy sections of cast iron? One reason is that Ni-Rod "55" electrodes are easy to handle . . . even weldors of limited experience get good results. Another reason is that this electrode has a special nickel-iron core wire that gives strong, ductile, easily machined deposits. Smooth bead contours. Excellent wash. And easy slag removal.

Also . . . by using Ni-Rod "55" electrodes, 9 out of 10 cast iron welding jobs can be done without preheating or postheating.

Do you have a question about welding cast iron? There's a good chance you will find the answer in our new 16-page booklet, "A Handy Guide to Welding Cast Iron with Ni-Rod* and Ni-Rod "55". Fully illustrated. Filled with case histories . . . instructions . . . technical data . . . tips. Write for a copy today.

*Registered trademark

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK **Welding Products** Electrodes • Wires • Fluxes

All New... A.O.Smith

NEW FEATHERWEIGHT HAND GUN

. . . is as easy to use as pointing your finger. Water-cooled, it has no "O" rings . . . eliminates leakage. Ends necessity for complicated switchovers when changing wire sizes. All connections are fully protected Streamline design increases visibility.

C-OMANUAL

Carbon Dioxide Hand Gun Welding

...offers amazing economy and high degree of automation!

★ Cuts gas cost to practically nothing!

1¢ per cubic foot for carbon dioxide as compared to almost 7¢ for Helium and 9¢ for Argon... and you use much less. Savings in gas alone will more than pay for your C-OMANUAL unit in several months.

★ Clean slag-free welds!

No flux to clean, no chipping, no scraping.

★ Fast, fast, fast!

Several times faster than the fastest stick electrodes... as fast, or faster than any semi-automatic process in existence.

★ Visible arc

Keeps you in the groove... assures consistent weld quality. Speeds spotting of nozzle.

★ New simplicity of operation

There's no constant fiddling with settings. Console automatically controls arc length... compensates for operator's arc distance variations.

★ Deeper penetration

Assures sound, uniform welds with excellent strength and ductility.

SEEING IS BELIEVING — Try C-OMANUAL yourself at the AWS Show, A. O. Smith Booth No. 90. For complete facts and information on availability, contact your man from A. O. Smith.

COMPACT, EASILY PORTABLE CONTROL CONSOLE

Mounted on free-rolling rubber casters, the control console is easy to move from spot to spot. It contains wire reel, feed and speed controls, easily traced electrical circuits and all gas and water connections — *plus the exclusive two-speed head* which allows operator to get proper feeds for light or heavy wire by mere flick of selector switch. Controls on front panel are conveniently grouped, easy to read.

Through research ... *a better way*

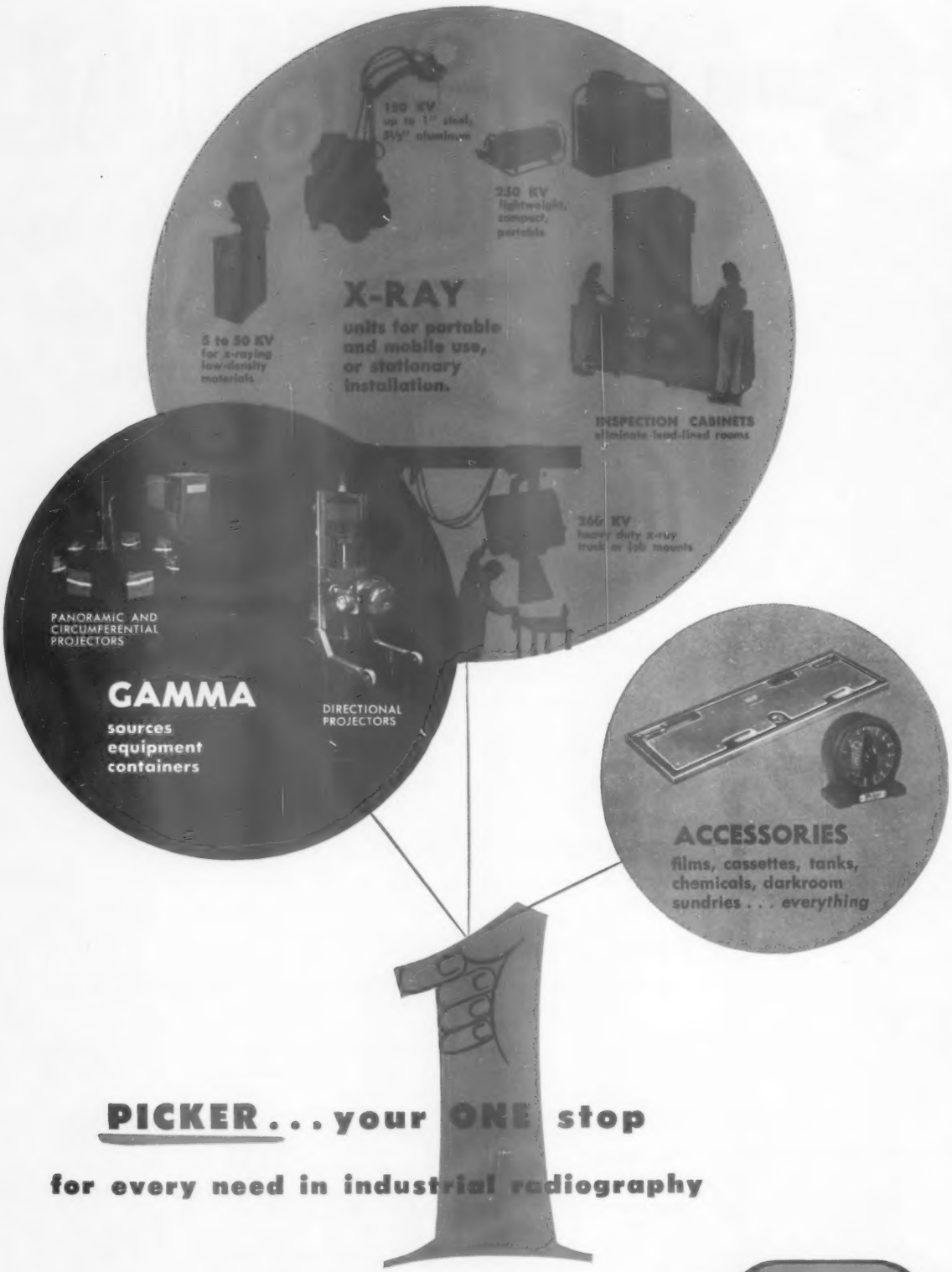
A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: Milwaukee 1, Wis.



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for every need in industrial radiography

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BRANCHES IN PRINCIPAL CITIES IN U.S.A. and CANADA

Picker x-ray

SEE WHAT'S NEW!

VISIT LINDE

AND GET ACQUAINTED WITH THE LATEST TIME AND COST SAVING DEVELOPMENTS ON—

Revolutionary new "Heliarc" cutting . . . makes clean cuts in aluminum as fast as 300 in. per minute.

The blowpipe with a greater job range than any other hand welding blowpipe . . . the "Oxweld" W-45.

The fastest, deepest penetrating of all welding processes . . . "Unionmelt" welding.

Fast, easy-to-use manual and mechanized "Heliarc" and sigma welding torches.

SEE ALL THESE AND MORE, MAY 9-11, 1956

A. W. S. Welding and Allied Industry Exposition

Memorial Auditorium, Buffalo, N. Y.

Linde Air Products Company, a Division of Union Carbide and Carbon Corporation, Offices in Principal Cities
In Canada: Linde Air Products Company, Division of Union Carbide Canada Limited, Toronto

"Linde", "Heliarc", "Unionmelt", and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

THE TOUGHEST, MOST FLEXIBLE WELDING CABLE you've ever used!

Ask any welder who uses Carol Dynapower Welding Cable. He'll tell you it's so pliable that he can bend it, coil it, and twist it wherever he wants . . . with so little effort that he makes top quality welds with minimum fatigue. The reason: Carol's special rope lay stranding that combines thousands of soft, fine wires into a flexible cable. It's plenty tough, too. Its abrasion-proof jacket of Carol rubber stands the roughest handling, and resists acids, solvents, water and oil. Available in sizes from 4/0 to No. 6 gage in rubber and Neoprene jackets.

. . . made better . . . to perform better

Like all Carol wire and cable, Dynapower Arc Welding Cable is manufactured under strict laboratory control in our complete wire-making plant. Every step, from drawing of wire to compounding of insulation, is centralized under our single responsibility. Write today for complete information to Dept. WE or see your nearby Carol distributor.

A SUBSIDIARY OF Penn-Texas CORPORATION

Carol CABLE COMPANY

DIVISION OF THE CRESCENT CO., INC., PAWTUCKET, RHODE ISLAND

Serving Industry for more than 30 years

it's almost magic...

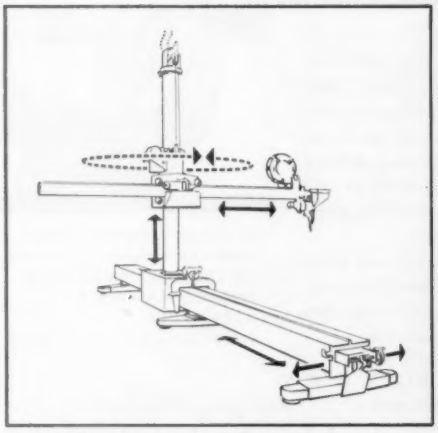
. . . when you can make difficult precision welds with robot-like regularity. But that's exactly what the LEWIS "Universal" can do.

Whether used for volume production or custom jobs, this automatic fixture cuts the time, sweat and high costs normally associated with large weldments.

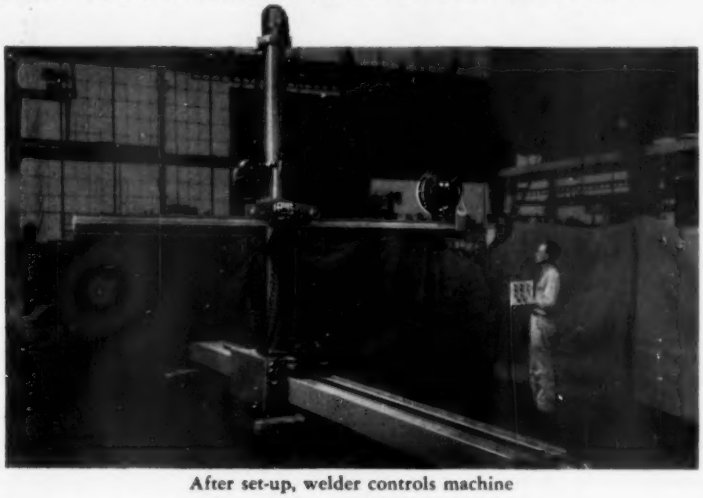
The "Universal" is portable . . . permits simultaneous 3-directional operation . . . has an adjustable base for quicker positioning of heavy weldments. In addition, any standard head can be installed for welding, flame cutting or hardening. Dual heads can be used to make parallel welds.

For complete details, write today or call BEdford 2-2500. Learn why *it's almost magic* . . .

. . . THE LEWIS "UNIVERSAL" AUTOMATIC WELDING FIXTURE



Designed to handle wide range of weldments, this unit is fully adjustable.



After set-up, welder controls machine with a remote pushbutton console.

LEWIS

THE LEWIS WELDING & ENGINEERING CORP.
WELDING DIVISION
77 Interstate Street **Bedford, Ohio**
6712-LW

A RADIANT HEATING SYSTEM

with 140 MILES OF COPPER TUBING, BRAZED

SUCCESSFULLY WITH.. SILVALOY

LOW TEMPERATURE SILVER BRAZING ALLOY

St. Justine's Hospital
Montreal, Canada

These two complete reference manuals for low temperature silver brazing and fluxing are available upon request. Send for either one or both.

The selection of Silvaloy for brazing the 140-mile-long radiant heating installation at the $30,000,000. St. Justine's Hospital, adds another important endorsement of the consistent, trouble-free performance and dependability of Silvaloy Brazing Alloys.

All joints in the system tested successfully at 250 lbs. psi—for ample assurance against a working pressure of only 75 lbs. psi.

Silvaloy Brazing Alloys and APW Fluxes are helping to speed production, lower costs and improve brazing results in many fields. Call your Silvaloy Distributor for information or technical assistance.

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APW

ENGELHARD INDUSTRIES

MAY
1956

Your *Weld World*

at press time

Last minute news of interest to those engaged in joining and severing materials.

. . Business is good; both welding equipment manufacturers and distributors are reporting March as best or near best month in business history. Distributor sales are up 15 to 40% over March, 1955; average rise is 27%. Welding equipment sales in 1956 should be up 20%.

. . Arc welding machines and electrode prices are up. Look for advances in prices of arc accessories—they are long overdue, considering increased cost of materials.

. . Gas welding equipment prices will be going up before long. Welding gases—oxygen and acetylene—went up from 7 to 20% in March.

. . Copper continues in short supply.

. . Fifty-cent copper will prompt further raises in price of bronze welding rods and electrodes.

. . Aluminum wire for Mig (metal inert-gas) welding is in short supply. Don't be surprised if you have to wait six to eight weeks for delivery of any type of aluminum welding wire for gas or Mig applications.

. . Current-carrying capacities of welding cables are being studied and will be re-evaluated.

. . Nickel shortages are showing up in a curtailed supply of stainless steel. Delivery dates are slipping up to 90 days on nickel-base electrodes for cast iron welding.

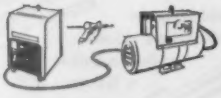
. . Structural steel is becoming so tight many fabricators are forced to pass up bidding new jobs. Some have been forced to lay off weldors because of material shortages. This situation may not ease much before mid-summer. Even steel companies do not have the steel they need for plant expansion.

. . High-tensile bolt people are finding themselves in the same fix welding has been in for years so far as building codes are concerned.

. . New developments in Mig welding of aluminum are in the wind.

. . Most manufacturers of welding equipment are looking for ways to expand production facilities. Many new plants are in the planning stages.

. . Business failures reported so far this year are running about 5% ahead of the same period last year. Most failures are small retail outlets.



. . The Navy Department will soon start a machine tool-replacement program which will include antiquated welding equipment.

. . Watch for new self-fluxing silver brazing alloys. These new alloys, containing 1% lithium, make possible the silver brazing of stainless in open air without flux.

. . Steel prices are going up. When the price rise comes it will be sizeable, so be prepared.

. . Small businesses can expect to start getting more orders from Uncle Sam now than in the past.

Model 5 WELDING TORCH
An all-purpose torch with many improved features. Accommodates C-5 cutting attachment.

It's a Pleasure!

Model C-5 CUTTING ATTACHMENT
Cuts up to 5" thick steel. All latest improved features. Fits No. 5 Welding Torch.

Model 4-H HEATING TORCH
Designed for fast, all around heating.

Model CM CUTTING TORCH
A low cost, compact general-purpose torch.

Model C CUTTING TORCH
A complete, all-purpose torch. Range of tips and head angles.

Model L HI-SPEED CUTTING TORCH
Improved design for efficient use of low pressure acetylene or fuel gases. 90° head only.

Yes Sir, Dockson "Hi-Speed" Welding and Cutting Torches sure take the drudgery out of the job.

Beautifully designed for rigid, one piece, silver soldered construction that gives you years of toughest day after day use.

Carefully balanced for effortless handling, even on those inaccessible jobs.

Quality built for top performance on any job from light plate to heavy castings.

There's a Dockson top quality torch built to do your job better, faster, and more economically. They are priced to fit your budget.

DOCKSON torches are *Built for Better Service*

Dockson CORPORATION

3839 WABASH AVENUE,
DETROIT 8, MICHIGAN

Aluminum Welding Cable

Makes Your Job Easier!
Saves Effort!

Lighter weight and superior flexibility lets you weld faster and easier on every job . . . less operator fatigue!

Type D-866 *Aluminum* Welding Cable is available in all standard sizes from General Cable.

General Cable . . . *at your service!*

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y. Offices and Distribution Centers Coast-to-Coast

Light weight torch cuts 4" steel-*FAST*-at low pressures

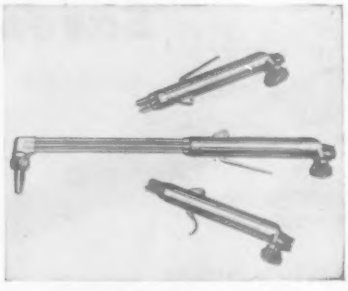
SMITH'S **Silver Star☆ CUTTING TORCH**

This is a light torch—only 2 lbs. 9 ozs. for the 20½" length. But, the way it cuts thick steel at low gas pressures is something to see. Eight pounds is all you need to cut up to ½" steel. For heavier cuts, pressures are proportionately low. Oxygen consumption reduced by 50% in some cases. That's real economy!

Another thing: You don't need a wrench with this torch! Tips slip into torch head, tighten with twist of fingers. That's a time saver! (Special Smith patent.) Lever Over Handle, Lever Under Handle, or Trigger — you have all 3 in this one torch to suit all operator requirements. Ask us for complete details on this sensational new cutting torch.

Only 8 lbs. gas pressure cuts ½" steel

Observers can't believe their eyes when they see this new Smith's Torch cutting ½" steel with only 8 lbs. oxygen pressure. Look at the gas you save! This torch costs less to operate.



Saves up to 50% oxygen

That saving counts up over a period of time! Even heavy cuts up to 10" take less gas than ordinary equipment. This torch is versatile and economical. "Burners" told us what they wanted and we built those features into this torch.

See us at Booth 83, AWS Welding Show, Buffalo, N. Y.

Full information on request — mail coupon

SMITH WELDING EQUIPMENT CORP.

DEPT. WE-173 • 2633 S.E. 4th Street • Minneapolis, Minn.

NAME_____

ADDRESS_____

CITY_____ STATE_____

COMING EVENTS

MAY 8-11: Thirty-seventh Annual Meeting, American Welding Society, Hotel Statler, Buffalo.

MAY 9-11: Fourth Annual Welding Show, Memorial Auditorium, Buffalo.

MAY 14-17: Design Engineering Conference, American Society of Mechanical Engineers, concurrently with Design Engineering Show, Convention Hall, Philadelphia.

MAY 23-25: Southern Appalachian Industrial Exhibit (Bluefield Coal Show), Pocahontas Electrical & Mechanical Institute, Bluefield, W. Va.

JUNE 4-7: Special Libraries Association Convention, Hotel William Penn, Pittsburgh; Metals Division program, Monday afternoon, June 4.

JUNE 4-8: X-ray Diffraction School, North American Philips Co., Inc., Hotel Morrison, Chicago.

JUNE 17-22: Annual Meeting, American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J.

JUNE 25-29: Annual Meeting, American Society for Engineering Education, Iowa State College, Ames.

JUNE 27-29: Summer Meeting, Compressed Gas Association, Seaview Country Club, Absecon, N. J.

SEPT. 20-21: Eastern Zone Meeting, National Welding Supply Association, Hotel Statler, New York City.

SEPT. 24-25: Central Zone Meeting, National Welding Supply Association, Hotel La Salle, Chicago.

SEPT. 24-28: X-ray Diffraction School, North American Philips Co., Inc., Sir Francis Drake Hotel, San Francisco.

SEPT. 24-28: Trade Fair of Atomic Industry, Atomic Industrial Forum, Inc., Navy Pier, Chicago.

SEPT. 25-27: Third Annual Atomic Industrial Forum Conference, "Management & Technology for Atomic Industry," in conjunction with Trade Fair, Morrison Hotel, Chicago.

OCT. 8-12: National Fall Technical Meeting, American Welding Society, Cleveland.

OCT. 8-12: Thirty-eighth National Metal Exposition and Congress, Cleveland Public Auditorium, Cleveland.

OCT. 29-30: West Central Zone Meeting, National Welding Supply Association, Hotel Nicollet, Minneapolis.

NOV. 1-2: Western Zone Meeting, National Welding Supply Association, St. Francis Hotel, San Francisco.

DEC. 3-4: Southeastern Zone Meeting, National Welding Supply Association, Dinkler-Tutwiler Hotel, Birmingham, Ala.

DEC. 6-7: Southwestern Zone Meeting, National Welding Supply Association,

Special Libraries group meets in Pittsburgh

The Metals Division, Special Libraries Association, will holds its program at the Special Libraries convention in Pittsburgh, June 4-7 at the Hotel William Penn.

The conference theme will center around "Putting knowledge to work," while the Metals Division will have as its topic "Creative thinking."

Magnetic? OR Electronic? WELDER CONTROL — WHICH WILL DO YOUR JOB BEST?

Square D makes them all... for simplest or most exacting applications!

Magnetic

for General Purpose Machines

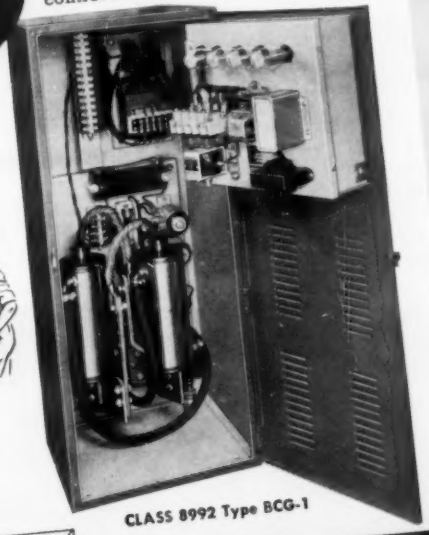
For applications requiring widely varying welding conditions, normal welding speeds and maximum simplicity.

CLASS 8992 Type BBG-1

Electronic

for High Speed Welding

For production line (gun or stationary) welders and other applications where high speed, high currents or dual gun control are factors.



CLASS 8992 Type BCG-1

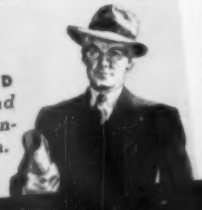
Electronic (SYNCHRONOUS)

for Precision Welding

For welding aluminum, other non-ferrous and ferrous metals requiring precision weld times; stepless heat control; slope or taper control.

CLASS 8993 Type BDG-2

You'll find your nearby **Square D Field Engineer** *a source of sound counsel in selecting the welder control best suited to your application.*



SQUARE D COMPANY

ORIGINAL

Low Temperature

EUTECTIC

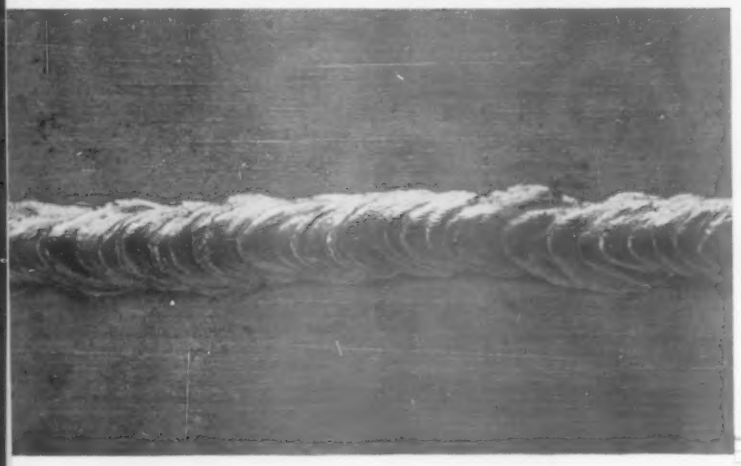
WELDING ALLOYS

EUTECTRODE®

2101 (DC)

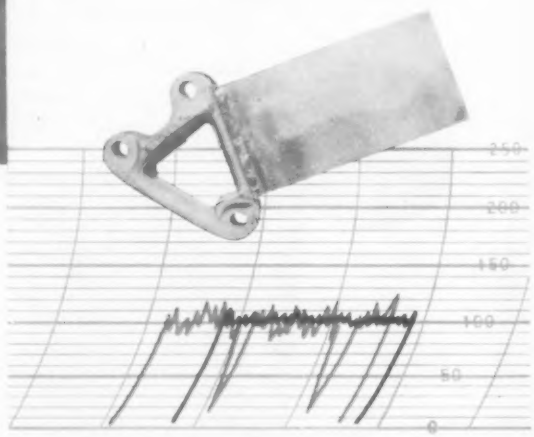
First Aluminum Electrode

makes welding aluminum as



EutecTrode® 2101 eliminates spatter and erratic, uneven transfer of alloy

You can see the difference between the coatings of an ordinary hand dipped electrode and the smooth, even extruded coating of EutecTrode 2101. Here's the difference that eliminates spatter, lets weld metal flow smoothly . . . makes possible all-position welding.



New EutecTrode® 2101 has amazing ARC STABILITY

This recording ammeter graph shows one of the reasons why EutecTrode 2101 is superior to conventional electrodes. Short circuiting by conventional electrodes *(red line)* caused by erratic arc action, uneven transfer of alloy. EutecTrode 2101 *(black line)* has excellent arc stability — lets anyone who can weld mild steel weld aluminum.

Relentless research originates new advances in metal joining.

Intricate production steps guided by rigid quality standards.

Modern facilities bring laboratory miracles into your shop.

® REGISTERED TRADEMARKS

ECTRODE 2101 DC

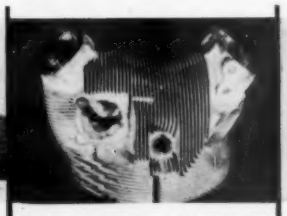
with extruded coating
easy as welding mild steel!

The amazing extruded coating, developed by Eutectic Research, makes the new, patented EutecTrode® 2101 outperform any hand-dipped conventional electrode for aluminum. Here's why anyone who can weld mild steel can weld aluminum with EutecTrode 2101:

With EutecTrode 2101, weld metal flows smoothly — there's no spatter — no smoke to obliterate the weld area! EutecTrode 2101 has the strength, corrosion resistance, and high quality dense welding properties that make it ideal, not only for pure aluminum, but for wrought and cast alloys as well. Welds made with EutecTrode 2101 are flat, solid, glossy, and have excellent color match with aluminum—they're stronger too! And, just a tap on the metal removes slag, cleanly, quickly.

Using less amps, EutecTrode 2101 can often be applied without pre-heating. This minimizes or eliminates the warping, stress and embrittlement of the base metal associated with conventional electrodes.

Unloader tines welded with EutecTrode 2101 dipped 8 inches but joints did not break under 1,500 lbs. of cement blocks. Joints made with EutecTrode 2101 are up to 3 times stronger than those made with conventional aluminum electrodes.



Aviation aluminum cylinder heads repaired with EutecTrode 2101 passed X-ray tests. Other welding materials failed! EutecTrode 2101 required 33% less preheat, operated with 25% less amperage, saved 80% of reworking to free slag!

Pressure tight welds to prevent bacteria growth are required by law for milk handling. Truck bodies fabricated with EutecTrode 2101 pass these requirements easily. EutecTrode 2101 is easy-to-handle and makes smooth, non-cracking deposits.

U. S. Navy used 40 lbs. of EutecTrode 2101 to salvage this casting after it had developed porosity around a critical, watertight flange. The non-magnetic property of EutecTrode 2101 makes it perfect for ship construction.

Only a specialist on the scale of Eutectic with 650 personnel devoted to metal joining could develop this amazing electrode

The photos at the left show some of the many hundreds of metallurgists, chemists, engineers, production and customer service personnel at Eutectic's big Flushing, New York plant, research laboratories, and administration headquarters. Here is the perfect combination of talent, experience, and facilities to provide American industry, year after year, with new and ever better alloys to make metal joining easier and more profitable.

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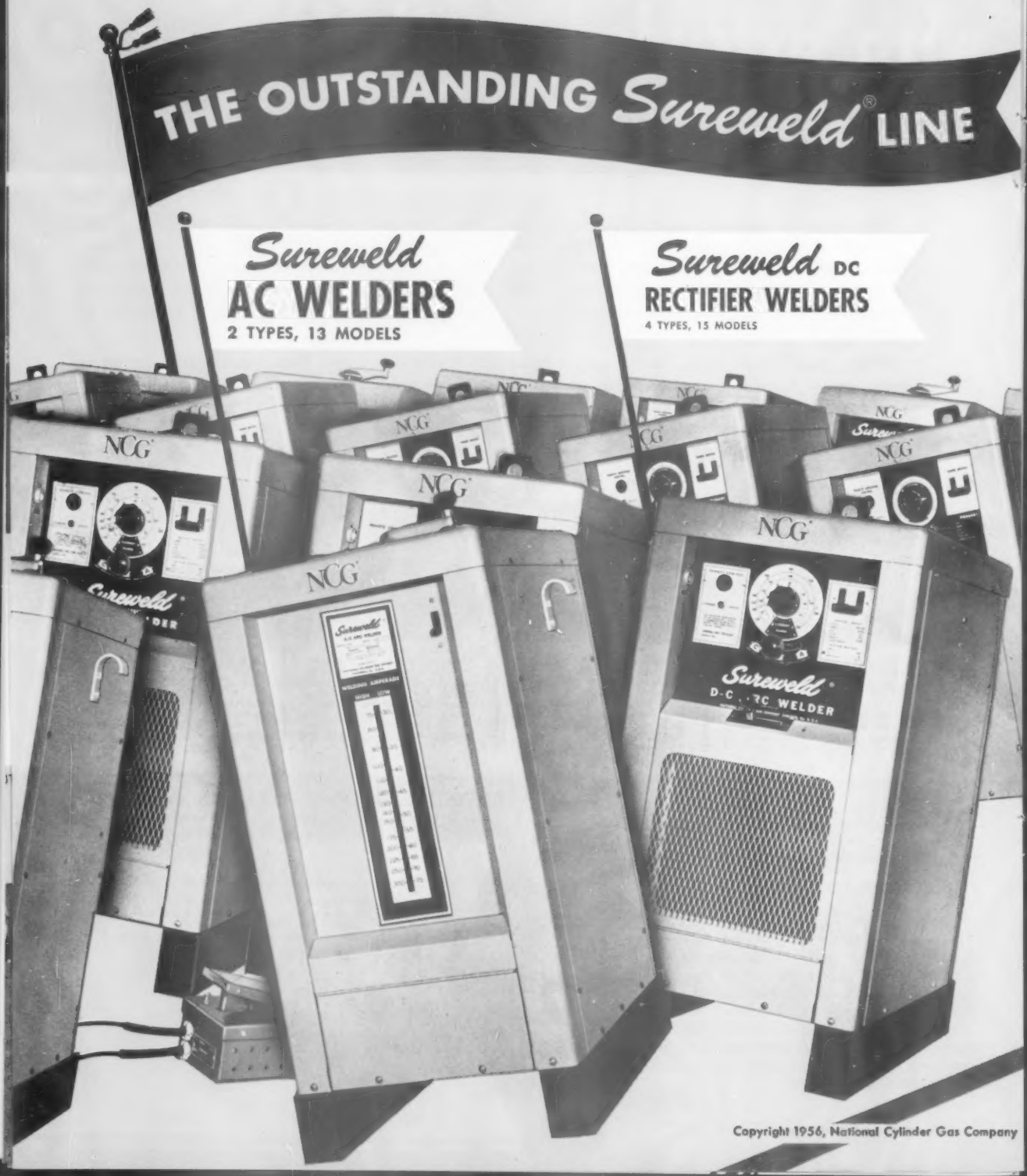

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Specifications and Procedures in Weldirectory SB-1351.
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MAY, 1956

Welding Engineer

ESTABLISHED 1916

Teach 'em to weld — here's how!

LAST month we discussed the shortage of engineers in America—especially those versed in welding and its applications. This deficiency is primarily caused by lack of adequate welding training and facilities in engineering schools.

From all indications, this situation will worsen before it gets better. Many engineering schools are shortening or entirely eliminating the shop courses.

Experience has convinced us that there is no substitute for shop training. The young engineer who knows his way around a shop is an invaluable asset.

Since most educators agree with this thinking, why are shop courses being dropped?

School leaders tell us there are two reasons:

(1) There is not enough time in a four-year curriculum to include shop courses.

(2) There is not enough money to properly equip and maintain modern shops.

These appear to be justifiable reasons, but they are not insurmountable. *It takes only the cooperation of those who believe in welding.*

A five-year course in engineering will correct the first problem. Some engineering schools have already adopted such a program. It should be adopted universally. This longer course would provide more time for shop work, yet enable the student to take self-expression courses.

ENGINEERING has not won its rightful place as a profession because most engineers lack self-expression. And until they express themselves properly, engineers will not be credited for the better living conditions they provide.

The second problem — lack of funds — is the greater one. Privately endowed schools have seen their funds shrink rapidly. Even tax-supported state schools have lacked needed funds.

Our particular interest is in better shop facilities for joining and severing materials — with emphasis on welding and cutting processes.

Down through the years, *some* manufacturers of such apparatus have given *some* schools *some* equipment. Unfortunately, such philanthropy can be carried only so far. We believe most producers would be glad to provide resources at (or near) cost. But where is the money to come from?

WE HAVE a plan for obtaining the needed funds in a relatively painless manner. With funds so raised, America's engineering schools would be adequately equipped within 10 years to turn out top-notch welding engineers.

The plan is simple. An institution, known as *The Foundation for Education in Welding* (FEW), would be the recipient of royalties from welding users. Manufacturers would collect royalties from users, who benefit in the long run from better trained engineers and technicians.

Naturally, this type of collection plan will necessitate the cooperation of both consumer and producer. Yet the amount would be so small that no one would be penalized.

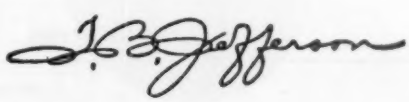
As a start, royalties would be derived from two products. A royalty of 1 cent per 10 lb (5 cents per 50-lb box) of arc-welding electrodes and 1 cent per 100 cu ft (3 cents per 300-cu-ft cylinder) of oxygen would be the basis.

Using last year's production figures of 571,284,926 lb of electrodes and 29,091,873,000 cu ft of oxygen, the foundation could begin with almost $3½ million in the welding fund.

Some will object to such a program, but future rewards will more than repay today's sacrifices. The facilities of WELDING ENGINEER will be made available so far as possible to get this program under way.

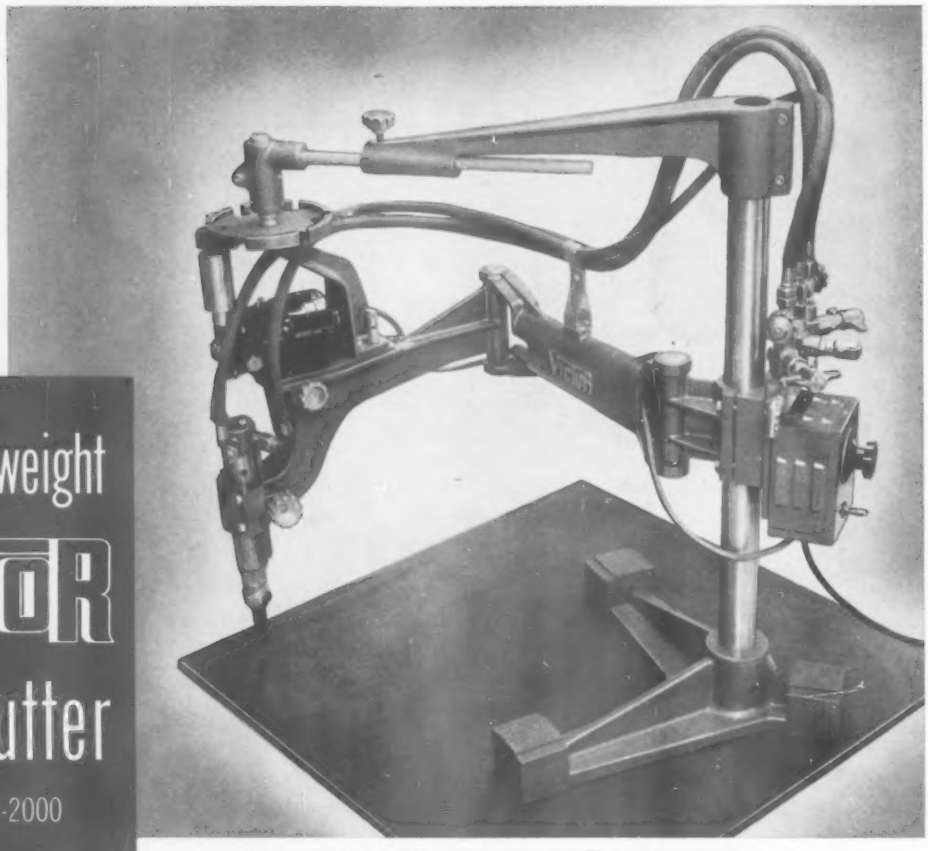
If we get cooperation from welding manufacturers, WELDING ENGINEER will gladly contribute $1,000 to the establishment of a nonprofit "Foundation for Education in Welding."

Who wants to be next in line?



New, lightweight VICTOR Duplicutter

MODEL DC-2000



Portable Model DC-2000 cuts circles to 19½" diameter, rectangles to 12" x 35", and metals to 8" thick. Torch accommodates all Victor 1-101 and 1-100 cutting tips, through size 5.

Flame cuts parts accurately, saves handling and set-up time, increases labor efficiency.

This portable VICTOR DUPLICUTTER weighs only 36 pounds. Operator easily carries it to any work location in plant, field or warehouse . . . thus saving you time and cost of moving materials. Set-up takes minutes only. You lose no time leveling DUPLICUTTER—its magnetized feet use stock being cut as working base. And it's so simple one man easily handles production from 2 or 3 DUPLICUTTERS.

Precise controls and powerful, permanent magnet in template follower enable you to duplicate parts to production tolerances of plus or minus 1/64". Easy, quick interchange of templates makes DUPLICUTTER practical for both long production runs or duplication of single part.

Why not see for yourself how easily the VICTOR DUPLICUTTER handles, how fast and accurately it cuts? Call your VICTOR dealer NOW and ask him for a demonstration on your job . . . or write us for descriptive Bulletin 353.

For maximum efficiency and safety, use genuine Victor tips and parts

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Old records topple as 1955 booms welding industry sales

By T. B. Jefferson

SEVEN HUNDRED million dollars is a lot of money, but that is what was spent for welding equipment, supplies and gases in 1955. From all indications, even more will be spent in 1956.

Nothing has grown quite like the welding industry. Yet, when you consider the importance of welding and metal fabrication in our everyday lives, such progress is not surprising.

In the short period of 60 years, we have seen this modern means of joining materials grow from a toy to a major fabricating process. The first practical applications were demonstrated in the 1890's and early 1900's. At that time, it was looked upon with considerable skepticism.

"A Natural Evolution"

First, there came resistance welding. Then came the carbon arc, to be followed a little later by the metal arc and, finally, with the development of a practical commercial means of producing acetylene, the oxyacetylene torch provided a means of joining as well as severing metals.

This revolutionary series of processes brought about a new and practical means of joining metals—a natural evolution that might have been expected when men began to work with metals universally.

The various welding and cutting processes have become so important in recent years that plants in many industries are now wholly dependent upon these facilities for normal production.

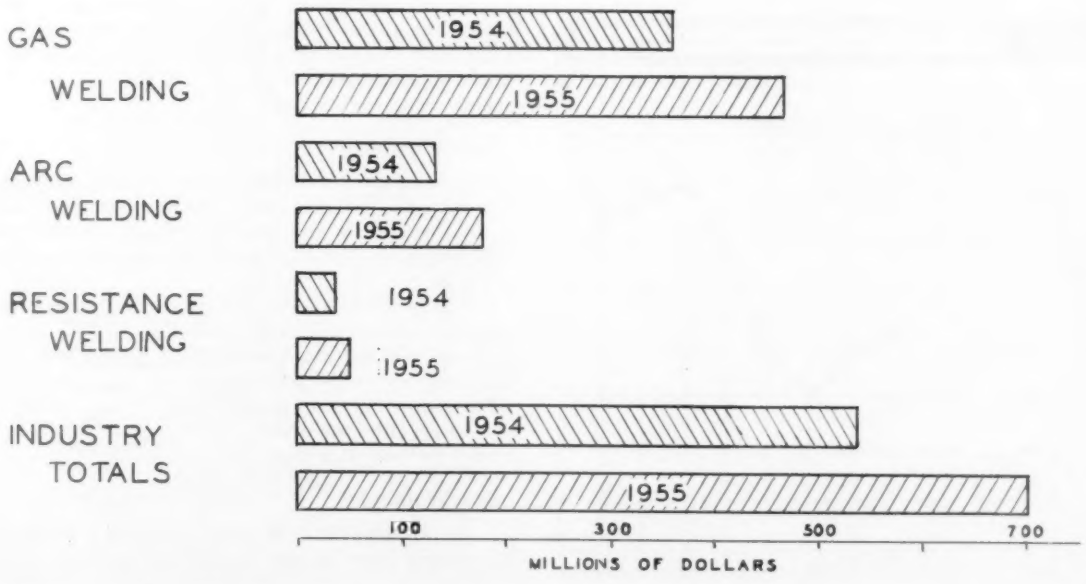
Uses for welding have expanded to such an extent that an estimated 25% of the country's working force derives its livelihood directly or indirectly from the use of welding and related processes.

Breaking Sales Records

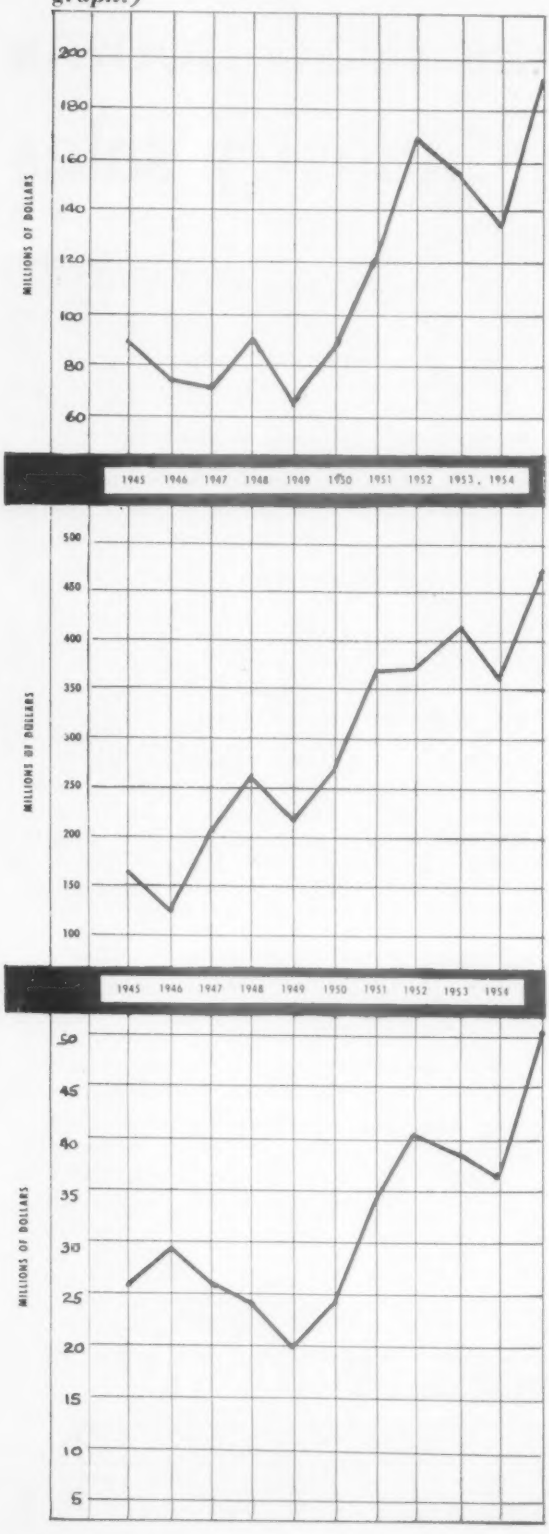
It was in 1951 that, for the first time in history, welding sales exceeded the half-billion-dollar mark. This year, that figure is exceeded by 40%.

The upward climb in welding industry sales we are now experiencing began in August, 1954. Since then, nearly every month has proved better than the previous one for most people selling welding to industry.

Major gains during the year were in the gas welding field where the sales of welding gases, both oxygen and acetylene, increased approximately 33%—a jump that caused dollar volume to leap accordingly to bring the total on these commodities to $424 million in 1955.



Comparative sales figures in arc, gas and resistance fields (from top to bottom) for 10-year period. ***(Figures for 1955 are indicated by last vertical line in each graph.)***



These amazing gains in the field of welding gases varied little from the over-all picture in all phases of the welding industry.

Everyone connected with this industry has been surprised at the startling growth during 1955, and the continuing growth carrying through 1956. The question in everyone's mind seems to be "how long will this go on?" A look at national growth and prosperity should fully answer this question.

Gas and Electrode Markets

The total spent for welding gases represented more than 60% of all the money spent in the welding industry. The next largest share went for welding electrodes which, in 1955, represented a $119 million market, the sales value of 571 million pounds of electrodes.

It represented the largest volume of welding electrodes since 1952, and the second largest since 1944. During the war years, over a billion pounds of electrodes were produced in one year (1943).

From a market standpoint, the major welding market continued to be the five-state, east north-central region comprising Illinois, Indiana, Ohio, Michigan and Wisconsin. Uses of welding, however, grew in all sections of the country. Welding and cutting are now found in factory, field and forest, wherever men work with machines and metals.

There undoubtedly would have been greater uses of welding in 1955 if it had not been for material shortages experienced during the year.

Steel in Short Supply

Much to everyone's surprise, there has not been enough steel. Many fabricating shops have laid off weldors because there is no steel to weld. Shortages also have developed in copper and aluminum. These latter shortages not only reduced the amount of welding being done but, in some instances, curtailed the amount of welding equipment, electrodes and rods produced.

Material shortages can be advantageous for welding. Such conditions actually emphasize the importance of welding processes, not only as a means of equipment maintenance and repair, but as a means of saving materials. During these times, industry finds that welding is the most effective way to repair broken parts, and that it often proves the easiest and cheapest way of making replacements, too.

Gas Welding

Because of the $424 million spent on welding gases, the gas welding industry easily became the major source of sales volume in the welding industry. A total of $472 million was spent for gases, apparatus, accessories and rods.

In 1955, $30.6 million was spent for gas welding apparatus, an increase of $4 million over 1954. Accessories and welding rods grossed $17.1 million, a $600,000 increase over the previous year.

The figure for gas represents an all-time industry high, as do all of the figures for other processes of the welding industry this year.

Arc Welding

In the arc welding field, there continued a program of switching from manual to automatic welding which

began several years ago. This program has led to increased sales of constant-potential and rectifier type welding machines.

When welding gases are excluded from the industry sales, arc welding becomes the sales leader. In 1955, a total of nearly $180 million was spent on arc welding machines, electrodes and accessories.

An increasingly important part of arc welding has been found in the further development of the Mig and Tig processes. Were we to include the gases used in these processes, another $19 million would be added to arc welding sales merely for argon gas alone.

The production of argon gas has grown rapidly during recent years, climbing from 106 million cu ft in 1951 to more than 216 million cu ft in 1955. Another gas of increasing importance in the gas-shielded welding process, aside from argon and helium, is carbon dioxide.

Reduced Gas Costs

By using carbon dioxide and CO_2-argon mixtures for shielding, one of the major objections of the inert process—that of the high cost of shielding gases—has been overcome. More development work is being carried on in this field, and it should result in some startling new processes before too long. The recent introduction of a semi-automatic manual process using carbon dioxide shielding is the initial step in this direction.

Arc welding machine sales reached an all-time high of nearly $43 million in 1955, exceeding the previous record year of 1952 by more than a million dollars.

Accessory sales were up nearly $3 million over 1954. Here again, the $17.9 million accessory sales figure established a new high for the industry.

Resistance Welding

During 1955, resistance welding fared better, percentage-wise, than any of the other welding processes. This showing can be attributed to several factors, not the least of which is a better understanding, on the part of both manufacturers, users and potential users, of the capabilities of resistance welding.

Sales in 1955 for resistance welding machines, electrodes and controls totaled just over $50 million: another all-time high, and double the amount spent for this type of equipment only five years ago.

Despite these high sales figures, the outlook for resistance welding is even better this year. Much of the money spent in 1955 went for resistance welding equipment to produce such defense items as military aircraft and guided missiles.

As in the past, there were also heavy expenditures in the automotive industry. With further retooling prospects in view due to extensive model changes this year, the outlook for resistance welding cannot help but remain favorable.

The demand for welding equipment is continuing, with sales in the first three months of 1956 averaging about 18% ahead of the comparable period in 1955. The general outlook for 1956, then, is extremely bright.

Shortages will probably continue to plague both equipment manufacturers and those users who would like to buy more equipment. Increased production facilities in all metal fields, however, may soon iron out shortage difficulties to provide everyone with the materials they need to do a job.

And welding and cutting processes will be at hand to make this job easier.

Gases for Welding

Annual production in cubic feet

	Argon	Acetylene	Oxygen
1951	106,034,000	6,272,030,000	21,806,073,000
1952	153,403,000	5,963,801,000	22,814,299,000
1953	175,321,000	6,525,000,000	27,573,600,000
1954	186,197,000	6,197,000,000	22,073,600,000
1955	216,314,000	8,204,317,000	29,091,873,000

How the Welding Dollar was divided

FOR:	Total Industry	Arc Welding	Gas Welding	Resistance Welding
Arc Welding	26.4%			
Machines		22.7%		
Electrodes		66.9		
Accessories		10.4		
Gas Welding	66.5%			
Oxygen			55.3%	
Acetylene			34.8	
Apparatus			6.0	
Accessories & Rods			3.9	
Resistance Welding	7.1%			
Machines				73.3%
Controls				19.8
Electrodes				7.9
	100%	100%	100%	100%

Figures for the Facts

How the Dollars Went in the Welding Industry

	1951	1952	1953	1954	1955
Gas Welding and Cutting Industry	$373,490,595	$374,913,810	$418,042,250	$365,640,643	$472,464,469
Arc-Welding Industry	124,902,648	170,022,502	157,589,284	135,933,996	179,982,555
Resistance-Welding Industry	34,094,529	41,794,453	38,153,601	37,321,291	50,312,245
Welding Industry Totals	$532,487,772	$586,830,765	$613,785,135	$538,895,930	$702,464,469

Source: WELDING ENGINEER Industry Estimates.

How Your Welding Dollar Was Spent

	1951	1952	1953	1954	1955
Arc-Welding Industry					
Machines	$ 32,194,160	$ 41,604,065	$ 36,773,165	$ 33,043,167	$ 42,984,164
Arc Electrodes	78,775,790	111,930,454	104,831,898	87,881,398	119,063,630
Accesories	13,932,698	16,487,983	15,984,221	15,009,431	17,934,761
Gas-Welding Industry					
Oxygen	196,254,013	205,328,703	229,842,689	198,369,000	261,419,570
Acetylene	125,439,987	119,276,095	139,187,436	123,949,000	162,932,174
Gas Totals	321,694,000	324,604,798	369,030,152	322,318,000	424,351,744
Apparatus	34,478,363	32,968,656	29,986,440	26,830,794	30,681,422
Welding Rod and Accessories	17,318,232	17,340,356	19,024,658	16,491,849	17,136,503
Resistance-Welding Industry					
Apparatus, Controls and Electrodes	$ 34,094,529	$ 41,794,453	$ 38,153,601	$ 37,321,291	$ 50,312,245

Source: WELDING ENGINEER Industry Estimates.

Electrode Production 1940-1955

In Pounds

	Pounds
1940	198,995,000
1941	386,886,131
1942	745,893,457
1943	1,086,784,300
1944	847,937,972
1945	541,829,046
1946	340,029,320
1947	360,098,430
1948	436,359,255
1949	329,596,600
1950	422,287,900
1951	549,327,781
1952	573,376,722
1953	547,614,604
1954	431,263,875
1955	571,284,926

Source: WELDING ENGINEER Industry Estimates.

Electrode Production 1940-1955

In Pounds Per Ton of

	Plates, Shapes and Sheets	Steel Ingots
1940	10.9	2.98
1941	17.7	4.67
1942	26.4	8.69
1943	46.7	12.22
1944	31.3	9.50
1945	21.9	6.90
1946	16.1	5.10
1947	12.6	4.25
1948	14.9	4.92
1949	15.2	4.25
1950	15.6	4.35
1951	17.7	5.23
1952	22.8	6.15
1953	20.4	4.94
1954	15.4	4.88
1955	15.8	4.88

Source: WELDING ENGINEER Industry Estimates.

Welding Wire Production

Electrodes and Wires

	Pounds
1940	237,780,000
1941	425,574,744
1942	803,755,822
1943	1,133,876,000
1944	890,243,721
1945	589,371,842
1946	370,632,958
1947	388,121,600
1948	467,986,321
1949	352,668,360
1950	450,848,053
1951	587,780,940
1952	607,496,832
1953	580,223,145
1954	460,942,721
1955	604,387,921

Source: WELDING ENGINEER Industry Estimates.

Steel Production in the United States 1940-1955

	Ingots Tons
1940	66,981,662
1941	82,927,557
1942	86,029,921
1943	88,836,366
1944	89,641,575
1945	79,701,624
1946	66,602,706
1947	84,783,981
1948	88,533,729
1949	77,868,353
1950	96,713,276
1951	105,134,553
1952	93,156,375
1953	111,609,716
1954	88,311,652
1955	117,382,024

Source: American Iron & Steel Institute.

	Plates, Shapes and Sheets Tons
1940	18,107,108
1941	23,342,334
1942	27,488,389
1943	23,219,605
1944	23,498,712
1945	24,681,737
1946	21,396,280
1947	28,492,386
1948	29,215,509
1949	21,670,929
1950	26,983,427
1951	30,826,444
1952	25,498,190
1953	26,889,093
1954	28,002,100
1955	36,097,565

Source: WELDING ENGINEER Industry Estimates.

The Welding Market 1940-1955

In Dollars Per Ton of

	Plates, Shapes and Sheets	Steel Ingots
1940	$ 7.0	$1.86
1941	8.2	2.30
1942	11.4	3.51
1943	17.4	4.06
1944	17.8	4.14
1945	11.2	3.49
1946	11.8	3.51
1947	10.7	3.64
1948	11.6	4.23
1949	14.4	4.11
1950	14.5	4.06
1951	17.2	5.07
1952	22.3	6.11
1953	22.8	5.59
1954	19.1	6.08
1955	19.5	5.99

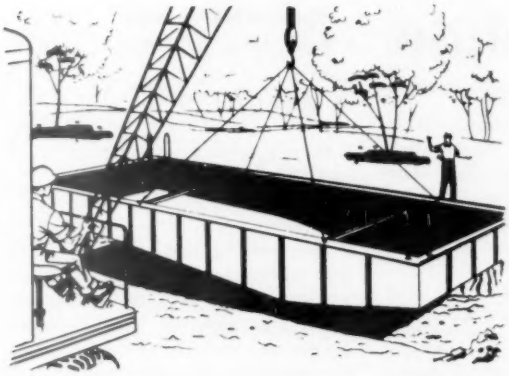
Source: WELDING ENGINEER Industry Estimates.

—Drawings and photo courtesy Hobart Bros. Co.

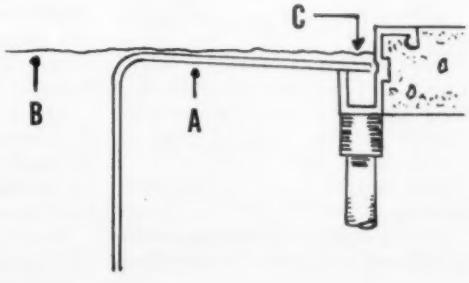
LARGE aluminum pool, 42 ft wide by 82½ ft long, is fabricated by two Mig weldors at installation site in Yellow Springs, Ohio.

Nowadays . . .

The old swimmin' hole is Mig-welded aluminum



SMALLER pools are fabricated in a factory and transported to excavation as a finished unit.



ROLL-out ledge around pool (A) slopes downward toward overflow (C). When water level (B) is raised, flotsam may be swept onto ledge.

PERMANENCE, coupled with economy in purchasing, installation and maintenance, are the swimming pool advantages offered to customers by Chester Products Co., a division of N. Ransohoff, Inc., Hamilton, Ohio.

The firm fabricates all-welded aluminum pools with the Mig (metal inert-gas) welding process. Practically any size of pool can be constructed, and many are carried to installation sites as complete units.

Where a large club or park-size pool is desired, the Chester factory prefabricates large, transportable sections of ¼-in. aluminum and trucks them to the point of installation. Here, sections are set up and tacked with Mig welders.

Fabrication Technique

Side plates are reinforced with angled struts at close intervals. Gussets brace the roll-out ledge. Bottom plates extend under side plates and are Mig welded to the angled struts.

All butt welds on the aluminum plates are made with Mig units using 1/16-in. aluminum wire. Wire feed speed is 185 in. per minute, and argon gas is used as a shield.

In the field, a 400-amp, constant-voltage welder, driven by a gasoline engine, supplies 220 amp and 32 volts to each Mig unit for simultaneous use by two weldors.

Chester's decision to use the Mig process was influenced by many factors. The need for flux—and the possibility of flux entrapment—is eliminated. No costly postweld chipping or grinding is necessary and welding speed is greatly increased.

Three-Day Installation

A residential-size pool (32 by 16 ft or 42 by 20 ft) can be installed in three days under normal conditions. On the first day, an excavation is made 6 in. deeper, 4 ft wider and 4 ft longer than the size of the pool tank.

On the second day, a crane moves the entire prefabricated pool from a delivery truck into position on a smoothly-graded, preformed gravel bed. The third day's operations consist of back-filling the excavated space around the pool tank with gravel and grading surrounding ground for a walk.

Refreshing summer dips may commence as soon as proper plumbing connections have been made.

HOTEL Statler at upper right will be headquarters for AWS spring meeting in Buffalo, N. Y. Technical papers will be read here during 21 sessions from May 7 to 11.

10,000 expected at AWS spring meeting and welding show

FROM every corner of the nation, members of the American Welding Society—and others interested in welding—will converge on Buffalo, N. Y., during the week of May 7-11 to convene the organization's annual spring meeting.

An estimated 10,000 visitors will also have an opportunity to witness a million-dollar display of equipment and supplies on exhibition at the fourth annual Welding Show.

Over 100 welding engineers have prepared 65 technical papers to be read at 21 sessions during the course of the five-day meeting at the Hotel Statler. Exhibition and demonstrations of the latest in welding products will take place in Buffalo's Memorial Auditorium on three of these days—May 9-11.

John J. Chyle, director of welding research at A. O. Smith Corp., Milwaukee, and newly elected president of AWS, will be installed in his office for the 1956-57 term at this meeting. Mr. Chyle succeeds J. H. Humberstone, president of Air Reduction Sales Co., who will preside over many functions of the spring meeting before relinquishing his title of society president.

Installation of Officers

Also taking office at this meeting will be First Vice-President Clarence P. Sander of U.S. Steel Co., and Second Vice-President Gustav O. Hoglund, Aluminum Co. of America.

Elected to serve as directors-at-large are:

John H. Blankenbuehler, Hobart Bros. Co.; George E. Linnert, Armco Steel Corp.; Gordon Parks, Solar Aircraft Co., and Francis H. Stevenson, Aerojet-General Corp.

New district directors to be introduced at the meeting are:

Donald B. Howard, American Car and Foundry (Middle Eastern, Dist. 2); Thomas R. Berg of J. Calvin Jureit & Associates (Southeast, Dist. 4); Keith Sheren, Taylor-Thompson Machinery Co. (Central, Dist. 6); Frank G. Singleton of Singleton Welding Supply Co. (Midwest, Dist. 8), and Charles L. Breese, John Tillman & Co. (Western, Dist. 10).

Sponsoring Groups

Two additional organizations in the metals field will join with AWS to co-sponsor five of the 21 technical sessions. The Atomic Energy Commission's welding committee has aided in the preparation of three papers on nuclear reactor components.

Sessions on welding of dissimilar metals, welding of stainless steel, weld tests and designing for higher working stresses in pressure vessels are being co-sponsored by the metals engineering division of the American Society of Mechanical Engineers.

Some special features of the 1956 spring meeting and show will be a session on safety, health and fire prevention by the AWS technical activities committee, and an educational lecture series for engineering students.

Also in a "special" vein is the two-day non-technical welding conference designed especially to aid production executives in understanding the practical aspects of factory welding.

Among the regular features of the meeting, in addition to installation of

new officers, will be the annual business meeting, a banquet, and the president's reception, the outstanding social event of the meeting.

The Biggest Show

Breaking all existing records for number of exhibiting companies and size of displays, the Buffalo welding show will exceed by one-third the size of exhibits at the Kansas City, Mo., show in 1955, and by 28% the record set when the show was last held in Buffalo in 1954.

Vying for the attention of visitors will be hundreds of new products that have never been shown before. Demonstrating this new equipment under simulated factory conditions will be approximately 750 representatives from many manufacturers of welding supplies and equipment.

Included on the latest list of manufacturers displaying welding products are:

Welding Show Exhibitors and Booth Numbers

Acetogen Gas Co. (71)
Acro Welder Mfg. Co. (210)
Air Reduction Sales Co. (52-4, 67-9)
Alloy Rods Co. (79, 80)
All-State Welding Alloys Co., Inc. (35)
Aluminum Co. of America (64, 65)
American Manganese Steel Div. (62, 63)
American Platinum Works (96)
American Pullmax Co., Inc. (212)
Ampco Metal, Inc. (1)
Ampower Products Co. (120)
Arcair Co. (21)
Arcos Corp. (97, 98)
Aronson Machine Co. (103)

Balteau Electric Corp. (208)
Banner Welder, Inc. (42)
Bay State Abrasive Products Co. (36, 37)
Bernard Welding Equipment Co. (82)
Brennen, Bucci & Weber (3)

Cam-Lok Div., Empire Products (219)
Cayuga Mach. & Fabr. Co., Inc. (50, 51)
Champion Rivet Co. (116)
Contour Marker Corp. (81)

Diversey Corp. (61)
Dockson Corp. (123)

Easton Metal Powder Co. (9)
Engwald Corp. (213)
Erico Products, Inc. (28)
Eutectic Welding Alloys, Corp. (70)

BUFFALO's Memorial Auditorium will be the site of the largest AWS Welding Show ever held. Over $1,000,000 in welding equipment and supplies will be on display.

Federal Machine & Welder Co. (73)
Fibre-Metal Products Co. (99)
Frommelt Industries (111)

Gas Appliance Service, Inc. (5)
General Electric Co. (47-9)
Glendale Optical Co., Inc. (31)
Goldsmith Bros. Smlt. & Ref. Co. (110)

Handy & Harman (39, 40)
Hard Face Welding & Mach. Co., Inc. (204)
Harnischfeger Corp. (88, 89)
Heath Engineering Co. (17)
Hobart Bros. Co. (33, 34)
Holger Andreasen, Inc. (19)
C. B. Hunt & Son, Inc. (24)

International Nickel Co., Inc. (113-15)

Jackson Products (205)

K-G Equipment Co., Inc. (41)
Kirkhof Manufacturing Corp. (226)
KSM Products, Inc. (224B)

Lewis Welding & Engrg. Corp. (230, 231)
Lincoln Electric Co (72)
Liquid Carbonic Corp. (93)

McKay Co. (106)
Metal & Thermit Corp. (74, 85)
Metal Removal Co. (109)
Metallizing Co. of America (214)
Miller Electric Mfg. Co. (66)
Mills Welding Supply, Inc. (209)
Modern Engineering Co. (201)

National Cylinder Gas Co. (44-6, 55-7)
National Torch Tip Co. (101)

Oxo Welding Equipment Co. (218)

Page Steel & Wire Div. (38)
Pandjiris Weldment Co. (91)
Portomag Sales, Inc. (25)
Progressive Welder Sales Co. (26)

J. M. Ragle Industries (216)
Reid-Avery Co., Inc. (224)
Robotron Corp. (92)
Root, Neal & Co. (102)
Ross Operating Valve Co. (225)

Sciaky Bros., Inc. (100)
Sellstrom Mfg. Co. (206)
Sight Feed Generator Co. (227)
A. O. Smith Corp. (90)
Smith Welding Equip. Corp. (83, 84)
Square D Co. (108)
C. H. Stevens & Co., Inc. (122)
Stoody Co. (220-22)
Sylvania Electric Products Inc. (107)

Taylor-Winfield Corp. (94,95)
Tec Torch Co., Inc. (112)
Tempil Corp. (207)
Thomson Electric Welder Co. (118, 119)
Tweco Products Co. (54)

Uniflex Cable Div. (12)
Union Carbide & Carbon Corp. (76-8, 85-7)
Unique Turntable & Equip. Corp. (228B)
United Specialty Corp. (8)
United Wire & Supply Corp. (23)

Vacu-Blast Co., Inc. (121)
Velocity-Power Tool Co. (20)
Vicker Electric Div. (202, 203)
Victor Equipment Co. (228A)

Wall Colmonoy Corp. (10, 11)
Wagner Mfg. Co. (18)
Webb Corp. (15, 16)
Welding Alloys Mfg. Co. (217)
Welding Engineer (67)
Weldit, Inc. (22)
Welsh Mfg. Co. (211)
Weltronic Co. (117)
Westinghouse Electric Corp. (43, 58-60)
Whitehead Metal Prod. Co., Inc. (229)
Worthington Corp. (223)

STRINGER bead weldors work simultaneously to join 36-in. pipe. Control equipment can be seen leading to internal line-up clamp.

Like that fabled fellow who braves the elements to deliver the mail, the pipeline weldor puts in a fast-moving, 10-hour day in all sorts of weather to bring oil and gas from the South and Southwest into your city.

Stringing oil pipe is a mile-a-day welding job

By A. G. Barkow, *Supt. of Inspection*
Natural Gas Pipeline Co. of America
Chicago, Illinois

PIPELINING is generally thought to be a new and rather mysterious phase of transportation, and often considered a by-product of World War II. Actually, pipelining and pipe line welding has been a major factor in transportation of natural gas and oil products for more than a quarter of a century.

A pipe line crew may consist of several hundred men, approximately 20% of whom will be weldors and weldors' assistants. This latter group comprises the highest type of skilled labor in a pipe line crew.

Pipelining has developed into a mass-production operation and it is not unusual to find this entire operation proceeding across country at the rate of a mile or more per day.

Piping Materials

Pipelining is set up so that various operations move simultaneously and in groups to prevent interference. No single area is subjected to construction disturbance for a great period of time. Pipe lines generally are buried below the frost line and, therefore, do not interfere materially with crop planting or other farm activities.

High-pressure pipe lines are built either of seamless or of plate-welded steel tubes. Most modern, high-pressure lines use a relatively thin-wall, high-strength steel, which is pre-stressed to give additional strength characteristics.

Welded steel pipe is produced by forming flat plate into tubes and joining the edges either by a resistance welding process or by automatic submerged-arc welding.

Steel used in line pipe generally has a specified maximum carbon analysis of 0.28% and a maximum manganese content of 1.25%. Specified physical properties include a minimum yield of 52,000 psi and minimum tensile strength of 66,000 psi. Elongation is specified as 20% minimum in 2 in.

A Bit of History

This material normally is considered weldable under field pipe line welding conditions. During extremely cold weather it is occasionally advisable to preheat, particularly when large-diameter pipe with heavier wall thickness is being welded.

Pipe line welding started as an acetylene process in the early 1920's. The first applications of electric arc

TEAM of tie-in weldors complete a weld in a bell hole, joining one pipe string to another.

welding were made in the late 1920's.

Since pipe line welding was primarily field welding and all equipment had to be designed for rugged portability, it is little wonder that welding techniques also developed to fit in with field mobility. Naturally, the fact that pipe lines would be hundreds of miles in length dictated the necessity for maintaining a reasonable cross-country speed.

During the early days of pipe line welding, two, three or four joints were welded by a roll welding method and then joined into a continuous string by a mechanical clamp. With the weldor welding towards himself, it is not difficult to picture the development of what is now known as "downhill" welding, the method that is now standard in the pipe line industry.

When it was still common practice to roll weld a number of joints and join them in a continuous string, weldors were being trained to make position welds so that roll-welded strings could be joined by welding rather than by mechanical clamps.

The string was lowered into a trench and joined to the preceding string in a "bellhole," or enlarged point in the trench, giving rise to the term "bell-hole weldor."

The Firing Line

Another improvement in pipe line welding came with the "firing line," a group of specially trained weldors and helpers who only fitted and tack welded the strings. Later, this crew made the entire first pass and became the highly specialized "stringer bead" weldors.

As pipe line welding technique improved, roll welding was replaced by stationary or "stovepipe" welding and it was found that pipe could be welded above ground in strings of several thousand feet each. Thus, bell hole welding was eliminated in favor of "tie-in" weldors.

With the increase in pipe size, other improvements in pipe line welding were dictated either by economic or technical necessity. Thus, it was found that, as pipe diameter became so large that time was lost by a weldor working first on one side and then on the other, it was economically feasible to use two stringer bead weldors working simultaneously.

Improvements in welding quality brought about by this change also showed the new system to be technically desirable.

Additional weight of larger pipe increased the incidental external loading on the single stringer bead, causing this bead to crack at the juncture with the parent metal. To combat this, a second welding crew was set into the procedure, following immediately after the first crew to add a second pass (the so-called "hot pass").

This additional pass strengthened the basic joint by improving physical properties of metal in the stringer bead and by increasing joint thickness.

Further Problems

Continued increase in pipe diameter and weight further increased technical problems of welding the stringer bead. It was learned that partially finished stringer beads were subjected to externally imposed stresses. These stresses exceeded physical limits of the material, particularly when stringer beads were long and required greater welding time.

To solve this problem, the number of stringer bead weldors was increased, first, from two to three. Now, in modern large-diameter pipe line welding, four stringer bead weldors work simultaneously, one in each quarter of the weld. As soon as the stringer bead is completed, a second crew of weldors is on hand to apply the hot pass.

A second group of weldors, referred to as "back-end" or "finish-bead" weldors follow, each weldor completing his assigned weld. This crew of weldors "leap frogs" each other.

One weldor will complete three or four welds, then move to the front of the line. By the time he is again finished with his group of welds the other weldors have passed him.

Welding Procedure

Pipe line welding procedure is unique in several ways. Although welding procedure is similar on various lines being fabricated for different companies, the many variables in the field make it mandatory for each weldor to work out and qualify his own details within the structure of procedure requirements.

All pipe line welding is done by manual, d-c, electric-arc methods. Automatic welding has been given an unsuccessful trial. Downhill welding, starting at the top or side and working toward the bottom, is almost universally demanded.

Using this method, higher welding heat gives greater speed. Therefore, a greater number of beads or layers per given thickness is used. This produces a generally fine-grain structure with minimum spread of a heat-affected zone and good ductility with physical properties superior to the parent metal.

Electrode Variety

Downhill welding, because of its greater speed, is naturally more prone to defects and a high degree of skill is required to produce a clean weld. Modern pipe line welding requires radiographic quality, and this type of weld control is almost always specified.

To secure ductility in the stringer bead and greater strength in the completed weld, a combination of electrode types usually is specified. The E6010 electrode type has the ductility necessary to prevent cracking of

the stringer bead and, therefore, is frequently used for this pass.

An E7010 electrode has physical properties equivalent to the parent material and is used for build-up. Frequently, an E6010 is used for capping because of its smoother appearance and because it will not create pin holes at the pipe edges.

Parallel straight beads are preferred to weaving in most specifications where a single pass will not fill the groove. The cap is usually made by weaving to produce a more finished appearance.

The welding groove has a specified included angle of 60 or 75 deg, depending on the designer's preference. For factory-beveled pipe ends, a root face or land of 1/16 in. (±1/32 in.) is specified.

The gap between pipe ends is usually spaced "penny width" or "dime width," the usual standard of measurement in the field, with a 1/16 in. maximum spacing. This spacing allows the weldor to penetrate the joint and leave an inside bead approximately ⅛ in. wide and 1/16 in. high.

The use of high-strength steel for pipe line work, with a fairly high carbon and manganese content and an ever increasing "tramp element" content, is leading many welding engineers to preheating when temperatures approach or drop below 40 F. Here again, a problem is encountered requiring a great deal of study to produce economically the desired weld quality under adverse conditions and at a speed necessary to get the line in the ground.

Weldor Qualification

All pipe line weldors usually are required to make a full-procedure weld test prior to the start of each job, regardless of previous experience or layover time since the previous job. Such procedure tests are made in the field using pipe nipples of the same material, thickness and diameter as in the pipe line being constructed.

Each weldor must make a completed weld under conditions similar to the welding he will later encounter on the line. For this purpose, ends of the pipe nipples are set up so that the bottom of the test section is approximately 12 to 18 in. above the ground.

Welding speed and technique of individual weldors is recorded and kept for reference by the welding inspector. This is done so that the test weld and production welds are completed at approximately the same rate and with the same type of welding procedure. Of particular interest is welding heat used and thoroughness of weld cleaning.

Testing Methods

A welding inspector is in constant attendance during the test and may disqualify a weldor on weld appearance or on manual technique even before the weld has been completed.

After completion of a visually satisfactory weld, twelve cross-section specimens are cut from the weld, three in each quadrant. One specimen in each quadrant is subjected to a pull test; one is given a nick-break test and the last one receives either a root or face-bend test.

All specimens must satisfactorily comply with specification requirements. Failure of any one specimen automatically disqualifies the weldor.

STRINGER bead and hot pass welding crews start to join long pipe string. Note mobile welding machines and equipment.

Here are some examples of specification requirements:

1.523: Visual Examination

The weld must be free of cracks, inadequate penetration, burn-through and other obvious defects, and it must present a neat, workmanlike appearance. Undercutting adjacent to the final bead on the outside of the pipe shall not exceed 1/32 in. in depth.

1.5242: Results (tensile tests)

If two or more specimens tested break in the weld or at the junction of the weld and parent metal, and also fail to develop the minimum specified tensile strength of the pipe metal, the weldor shall be disqualified.

1.5252: Results (nick-break tests)

The exposed surface shall show no more than six gas pockets per square inch with the greatest dimension not to exceed 1/16 in. Slag inclusions shall be not greater than 1/32 in. in depth or ⅛ in. in width, and shall be separated by at least ½ in. of sound weld metal.

1.5263: Results (bend tests)

No crack or other defect exceeding ⅛ in. in any direction is present in the weld metal or between the weld and the pipe material after bending.

Weldors qualified for pipe line work may be subjected, at any time, to requalification merely by cutting a weld from the line and testing it by these standards. Failure of such a production weld also disqualifies a weldor for further work.

Since pipe line welding is so mobile, and the work of relatively short duration, requalification or retesting of a weldor who has once failed is seldom, if ever, allowed. Actually, a weldor whose production weld has been disqualified cannot be requalified for further work on that particular line.

This qualification procedure has become standard for all lines and has been accepted both by the industry and the weldors involved.

Production welding procedures, inspection and final line tests will be discussed in the concluding installment of this article, which will appear soon in WELDING ENGINEER. Don't miss it!

Welded rail cars are:

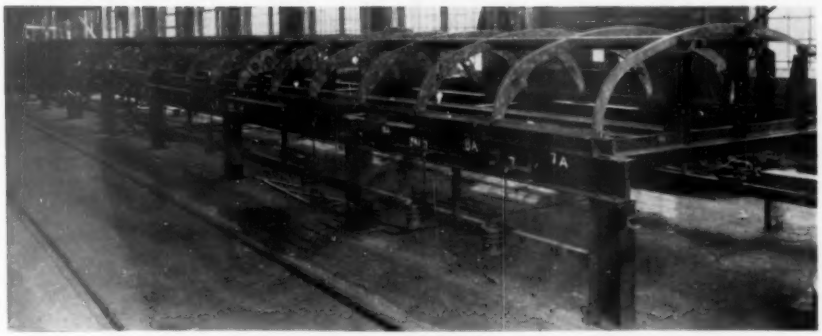
Stronger, lighter, roomier, cheaper

A MODERN, 85-ft deluxe passenger car body takes shape at the Altoona, Pa., shops of the Pennsylvania Railroad in a manner that is a far cry from fabrication techniques of 15 years ago.

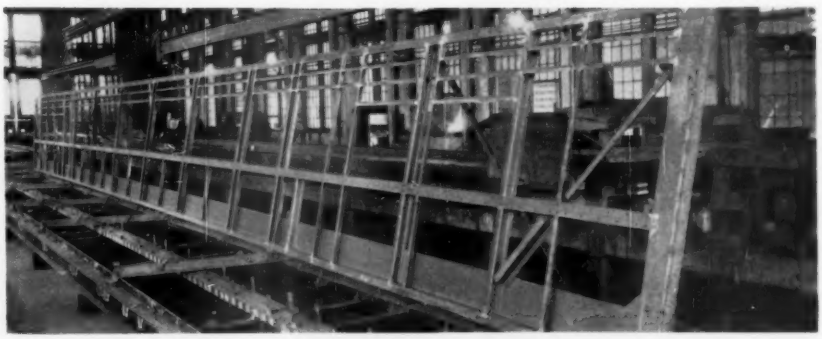
Car assembly, prior to World War II, was performed largely by riveting and bolting. This, of course, meant hard manual labor in drilling and punching, reaming and riveting—to say nothing of the ear-splitting noise.

Virtually all sub-assemblies from underframe to roof now are joined securely by noiseless arc welding. Both manual and automatic applications are used to provide a structure that is stronger and lighter, that contains more usable space and is built faster at lower cost.

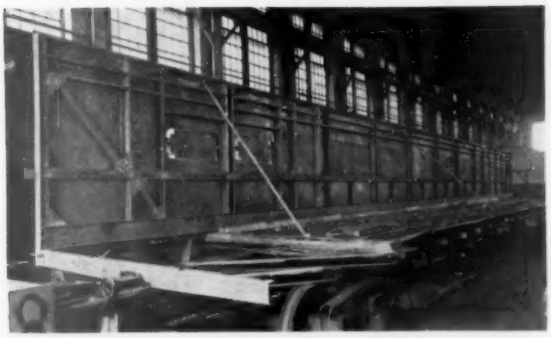
Pennsylvania has 1,300 trained weldors at work throughout its principal repair and construction center at Altoona, representing about 10% of the total working force there.



FRAMING jig positions 27 roof carlines for manual arc welding. Alignment is a critical factor, so good fit-up, strong jig and trained weldors are necessary.



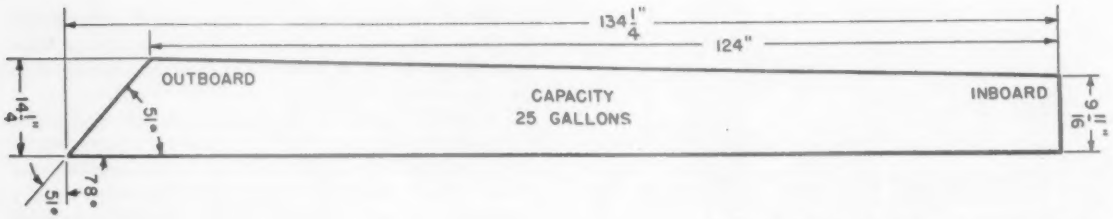
SIDE frame for rail car is lifted from positioning fixture. Manual arc welding, using E6012 electrodes, joins maze of channels, angles, tees, flats and corner plates. Skip welding on long seams limits distortion; over-all tolerance is 1/16 in.



—Photos courtesy Lincoln Electric Co.

COVER sheets have been submerged-arc welded to side frame. Window areas are flame-cut after welding is completed.

ROOF is joined to sides of passenger car. Welded steel sheets form the bottom of the car and length-wise stringers will support main flooring. Finished car meets all strength requirements, yet weighs only 139,500 lb.



SPECIFICATIONS for resistance welded leading edge wing tank for Grumman F9F-8 jet fighter.

Resistance welding solves a jet's limited-fuel problem

THOUGH it may possess a sound design, a "hot" motor, and an even "hotter" pilot, a jet aircraft is still only as effective as the amount of fuel it carries. And, packed as they are with indispensable equipment and armament, jets actually in the production stage offer little additional room for conversion into extra fuel space.

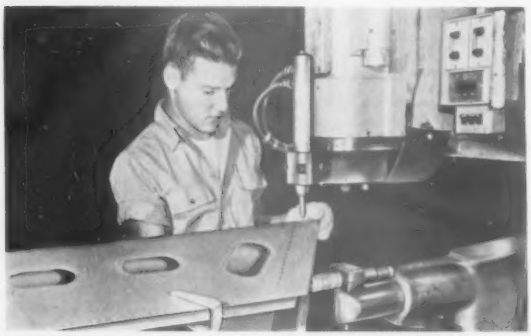
Grumman Aircraft Engineering Corp., Bethpage, N. Y., after studying the problem as it applied to their F9F-8 "Cougar" jet fighter, came up with a practical design for an integral, leading-edge wing fuel tank.

Design, however, was only the first step in a two-phase problem; the method of fabrication remained to be solved.

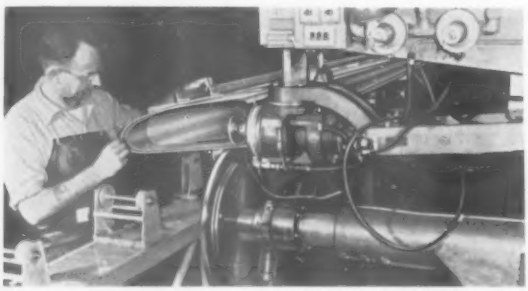
Rubber fuel cells were ruled out because the complexity and shape of wing rib placement presented the danger of chafing and possible tank puncture. Riveting was discarded as a fabrication technique because normal wing stresses could work rivets loose to cause leaks.

The Answer: Welding

Welding, then, was Grumman's only remaining answer, and fusion welding processes were given close



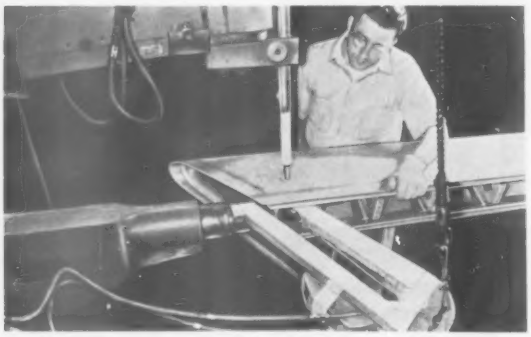
STEP 1: Tabs and liner are spot welded to skin.



—Courtesy Sciaky Bros., Inc.

STEP 2: Liner is seam welded to skin. Note small upper wheel allowing easy access to the weld area.

STEP 3: Tack welding ribs into position.



STEP 4: Inboard end rib is spot welded.

consideration. This led inevitably to the further problem of extra weight in the heavier gages of fusion-weldable alloys. These could not be considered in view of current design requirements.

Still another drawback was the loss of alloy strength resulting from extreme heat of fusion welding. At this point, resistance welding techniques were tested, and proved so successful that a test tank was assembled.

Filled with hydraulic oil at an operating pressure of 32 psi, the seam and spot-welded tank remained leakproof. After minor fixturing changes, this tank was put into full production.

Fabrication Steps

First step in the production operation on the leading edge tanks calls for tabs to be spot welded to 0.081-in. aluminum skin to locate the liner. An 0.041-in. aluminum liner is then tacked into position on the skin. A three-phase, 60-cycle spot welder developing 100 kva at 50% of duty cycle is used for this operation.

The liner is joined to the skin with a longitudinal, gas-tight seam weld in the second operation. A surface for mounting the trailing side closure to the tank is provided by the curved edge of the liner. A small upper wheel on a 200-kva, three-phase seam welder permits easy access to the weld area.

Additional Problems

In the third operation, ribs are located, clamped and tack welded into position. Ribs, which receive the web, are fabricated from an extruded section with an 0.245-in. surface and an 0.064-in. wall. The web is 0.040-in.-thick aluminum alloy.

When ribs have been tack welded into position, all clamps and fixtures are removed for final welding.

Three complex considerations are met in the fourth operation, in which the inboard end rib is tacked into position to the liner and skin. They are: (1) the 51-deg angle of the inboard rib, (2) the curve of the leading edge, and (3) the straight side of the end of the tank.

To accomplish this difficult operation, the lower horn of the spot welder—with its special extension and welding electrode—rotates. The pin above the lower horn in the lower arm acts as a cam on the bevel edge of the lower horn extension.

Positioning of the lower electrode into the tank at the 51-deg angle of the inboard end rib is made possible by the deep "C" shape of the lower horn extension.

The cam and bevel-guiding movement of the lower horn, together with the 51-deg angle of the extension arm, thus combine to meet the curve and changing angle of the leading edge. Elliptically shaped and beveled, the fixed lower electrode is constantly aligned with the leading edge surface.

Unique Set-Up

Other ribs must be spot welded into position by a tooling set-up that is equally unique. A quadrant lower arm extension, covered by bellows, is mounted on the fixed lower horn. Lower electrode tooling is motor-driven on the quadrant with rack and pinion.

As the electrode is moved into the curve of the leading edge surface, the opposite end of the electrode tooling is driven step by step down the lower quadrant arm. An inching button accomplishes each movement, after which the operator locks the electrode in position for welding.

The complications dealt with in the fourth operation are encountered again in step six of the welding process. They demanded a more complex tooling set-up in this instance, however, for seam welding is used and the tank must be maintained in exact position throughout the progressive movement of the seam welder.

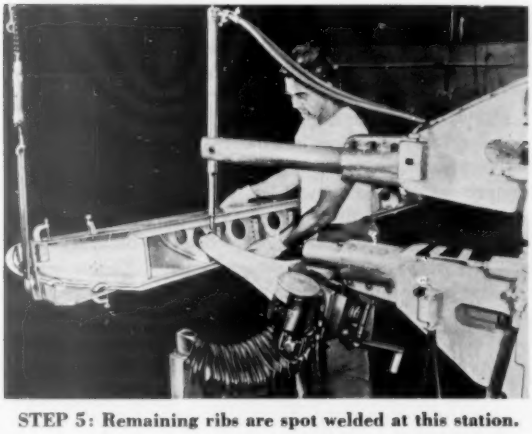
A special table holds the outboard end of the tank as the inboard end rib is sealed in the welder. The table allows the tank to rotate, and swings it 100 in.—a 39-deg arc—in both directions to provide the movement necessary for welding the 51-deg rib angle.

Tig Welded Closure

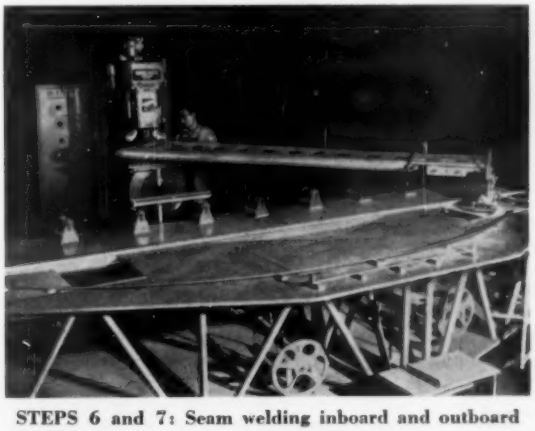
The seventh and final resistance weld on the fuel tank is the seam welding of the outboard end rib. This is accomplished on the same machine and positioning table as used in the sixth step. Because the outboard edge is straight, however, only rollers on the table are used to help the operator position the tank between the electrodes.

Final closure of the tank's trailing edge is done by the Tig (tungsten inert-gas) welding method. This process is allowable in this instance because the trailing edge was designed free of stressed and load-carrying members. Such design allows utilization of available fuel-carrying space.

Completed assembly time of the tanks, which hold 25 gallons of flight fuel, is 14 hours. Hundreds of the tanks are now in use, and no failure has yet been reported.



STEP 5: Remaining ribs are spot welded at this station.



STEPS 6 and 7: Seam welding inboard and outboard end ribs.

—Courtesy U. S. Steel Corp.

ARMOR plate welds during World War II were consuming large quantities of valuable chromium-nickel electrodes. Need for conservation led to E6015 development.

This is the sixth article in a series which began in WELDING ENGINEER in March, 1955. Author O. T. Barnett here describes the short, but valuable, life of the E6015 electrode, and the growth of the E6016 low-hydrogen type.

Filler metals for joining

By Orville T. Barnett*

SHORTLY after World War II, a new electrode, later to be designated as the low-hydrogen E6015, burst upon the welding scene. Sales people were spared the customary frantic search for superlative adjectives because a calm review of this electrode's properties was exciting enough.

Before long, the following applications were reported as ideal for the low-hydrogen, lime-type electrodes:

1. Welding hardenable steels without underbead cracking.

2. Welding high-sulphur steels without surface porosity and weld bead cracking.

3. Welding enameling stock without subsequent flaking of enamel.

4. Welding structures where impact strength at low temperatures was particularly important.

5. Welding complex, heavy structures where locked-up stresses often caused weld failures by cracking.

Some Background

A brief history of the E6015-E6016 electrode development should be helpful. At the outset of World War II, it was apparent that welding armor plate with stainless steel electrodes (AISI Type 310) containing 25% chromium and 20% nickel was going to consume astronomic quantities of these extremely vital metals.

Intensive research soon led to the molybdenum or manganese-modified 18-8 stainless steel electrodes, which had either a titania or a lime-base coating.

A further natural step was the development of manganese-molybdenum ferritic electrodes (typical anaylsis —carbon 0.10, manganese, 1.95, phosphorous 0.021, sulphur, 0.023, silicon 0.54, molydenum 0.39) which proved to be excellent on armor less than 1½ in. thick.

At first, these manganese-moly ferritic electrodes were designed with a rutile or titania-base coating not unlike that employed on E6012 electrodes. But the resulting epidemic of underbead cracking (cracking of base metal in the heat-affected zone adjacent to the filler metal) almost sentenced the manganese-moly electrodes to oblivion.

One enterprising electrode coating designer recalled that the 25-20 stainless electrodes had always been the maintenance weldor's ace-in-the-hole. Whenever a maintenance weldor encountered a difficult steel, lime type 25-20 stainless electrodes were a cinch to produce a good weld. Surely, the highly desirable strength-ductility combination of Type 310 stainless was part of the answer, but maybe the lime coating was partly responsible, too.

Bottleneck Eliminated

Out of this theorizing came the lime-type, ferritic manganese-moly electrode. Gone was the underbead cracking of armor plate. Another war production bottleneck was broken through.

*Assistant manager, Metals Research Dept., Armour Research Foundation of the Illinois Institute of Technology, Chicago.

TABLE I

Typical Mechanical Properties of E6016 Electrodes

As Welded

Yield strength, psi	60,000-75,000
Ultimate strength, psi	70,000-82,000
Elongation, % in 2 in.	25-35
Reduction of area, %	45-65
Impact strength, Charpy ft-lb:	
70 F	50-108
—100 F	25-45
Endurance limit, psi	40,000-45,000
Specific gravity, grams/cc	7.84-7.86
Corrosion resistance	comparable to mild steel
X-ray quality	excellent

Stress Relieved

Yield strength, psi	58,000-65,000
Ultimate strength, psi	70,000-75,000
Elongation, % in 2 in.	30-40

The culprit responsible for underbead cracking proved to be hydrogen. Moisture-producing coating ingredients formed hydrogen under the intense heat of the arc.

Hot steel will dissolve large quantities of hydrogen. As the steel cools, hydrogen has to escape and tremendous gas pressures are built up. These high pressures, coinciding with other internal stresses during martensitic transformation of hardenable steels, formed underbead cracks.

Thus, this family of lime-base electrodes was sired by low-moisture coating ingredients further improved by high-temperature baking at 600 to 700 F. And the low-hydrogen-producing tendencies of these electrodes is the reason they are generally described as low-hydrogen types today.

The latest mild steel arc welding electrode specification was adopted in 1955 (AWS Designation A5.1-55T, ASTM Designation A233-55T). It devotes considerable space to the E6015 electrodes. Yet, the E6015 electrode is virtually extinct. Let's see what happened.

Current Conflict

Lime-base electrodes, such as the original E6015, are limited to direct current, reverse polarity. In large sizes, arc action is liable to be rough and globular spatter may incite a weldor to coarse language when he gets burned.

With many large shops fairly well standardized on a-c equipment, welding engineers insisted on an a-c counterpart of the E6015 electrode type. As usual, a rising tide of demand led to the E6016 electrode.

For the E6015 electrode, coating ingredients included sodium carbonate, calcium carbonate, ferromanganese, sodium silicate and some other materials. To produce a-c properties in the E6016 improvement, potassium compounds are employed together with rutile or pigment grade TiO_2.

Now, both weldor and welding engineer are satisfied. E6016 electrodes work well on a-c and do a good job on d-c reverse polarity. Arc action is more stable, slag is more fluid, spatter is lessened appreciably, and solidified slag breaks out of a groove easily and separates from weld edges cleanly. Naturally, electrode consumers concentrated on the E6016 type until the E6015 virtually disappeared from the market.

Table I presents typical mechanical properties of E6016 electrodes. Almost without exception, E6016 weld deposits exceed 70,000 psi ultimate strength, 57,000 psi yield strength and 22% elongation in 2 in., stress relieved.

In so doing, they meet requirements for E7016 electrodes as outlined in *Tentative Specifications for Low Alloy Steel Arc-Welding Electrodes*, AWS Designation: A5.5-54T (ASTM Designation: A316-54T). Here again is the problem that an electrode *must* be given a *single* classification number. Some manufacturers prefer the E6016 classification while others select E7016 for their labels.

NEMA Listings

During 1953, NEMA statistical bulletins listed E6016 electrodes as low-alloy, high-tensile types including E6015, E6016, E7015 and E7016. Popularity of these electrodes exceeded all other XX15 and XX16 types by a ratio of two to one. Slightly more than 5% of all mild steel electrodes consumed are low-hydrogen types.

That the low-hydrogen electrodes are all-position types in the smaller diameters (5/32 in. and smaller) is borne out by Table II. The most popular diameter is 5/32 in., closely followed by 3/16 in. About one-fourth of the E6016 electrode group is consumed in the larger diameters, 7/32 in. through 5/16 in.

While E6016 electrodes may be used for vertical welding, this is not an application to be entrusted to any but the most highly skilled weldors. Slag volume is great, arc length must be kept as short as possible and manipulative techniques have to be restricted while current values are quite critical (see Table III).

Surprising Quality

Some five years after this electrode type was established, the welding engineer of a huge eastern shipyard visited the welding engineer of a nearby power piping producer. Here, the shipyard welding specialist watched shop weldors fabricate chrome-moly piping in all positions with EXX16 electrodes.

TABLE II

Relative Size Popularity of E6016 Electrodes

Diameter, (in.)	% of Total Used
5/64	0.01
3/32	1.0
1/8	10.5
5/32	29.1
3/16	28.8
7/32	6.3
1/4	17.3
5/16	3.1

TABLE III

Suggested Current Ranges for E6016 Electrodes

Electrode Size			
Diameter (in.)	Length (in.)	Amp	Volts
3/32	12 or 18	60-100	20-22
1/8	14	90-140	20-22
5/32	14	125-190	21-23
3/16	14 or 18	180-250	22-24
7/32	18	250-325	23-25
1/4	18	300-400	24-27
5/16	18	375-500	24-28

He marveled at exographs showing consistently sound welds. At lunch, he observed that, although he had seen the quality of work, he still found it hard to believe.

Welding low-alloy, high-strength steels, including many hardenable grades, is readily accomplished with the EXX16 electrodes. As previously explained, there is no underbead cracking in the heat-affected zone. In large construction jobs, maintenance weldors now use E7016 electrodes as a standard repair tool where 25-20 stainless was formerly the old standby.

A detailed report of the welding of 0.80 carbon drill steel used for drilling granite will point out a number of advantages found in EXX16 welding applications.

During a period of steel scarcity, a granite-producing company had a large stock of broken drills. The drills were about 16 ft long, 3 in. wide and ¾ in. thick. If these broken drills could be welded together, steel shortages would be unimportant. But previous welding attempts had been unsuccessful.

Welding Does the Job

Using the joint preparation shown in Fig. 2, drills were welded in one man-hour with perfectly satisfactory performance results. For this job, E9016 electrodes were selected.

The first pass was made heavy enough to withstand cracking of the initial weld bead. Fortunately, EXX16 weld metal has less than half the "blue-brittle" cracking tendencies of other weld metal deposits. As soon as the first bead was completed, the drill was turned over, slag was cleaned and the second bead was applied.

Beads were alternated from side to side until welding was completed. Only the first bead was deposited cold. Each succeeding bead benefited from the rising interpass temperature created by the preceding bead.

The joint was protected after welding to permit slow cooling. When cool, weld reinforcement was ground off to eliminate stress raisers due to a change in section and the drills were put in service.

"Sulphur-Tamer"

Before the advent of low-hydrogen, lime-type electrodes, high-sulphur steels were described as weldable. Usually, cold E6012 electrodes were specified for this application. But surface porosity often was encountered and weld bead cracking was a common occurrence.

One large producer of heavy electrical equipment forbade the use of high-sulphur steel for any parts to be welded. The savings in machining time did not offset headaches caused by welding troubles.

Steel makers shovel small mountains of limestone and countless lumps of ferromanganese into open hearth baths when sulphur runs high. Of course, the low-hydrogen electrode coating is liberally provided with these two sulphur tamers. And high-sulphur, free-machining steel performs in a docile and agreeable manner when it is welded with low-hydrogen electrodes.

Enamelers have adopted EXX16 electrodes for good cause. One producer of glass-lined pressure vessels used to weld leg brackets on the outside of his vessels with E6020 electrodes. While the glass lining was cooling after firing, hydrogen would be evolved from the steel adjacent to welds. Expensive glass lining (or vitreous enamel) would flake off.

Now, linings are often repaired with gold or other corrosion-resisting precious metals with costs relative to those a dentist charges for gold fillings. Such defects were greatly reduced through use of EXX16 electrodes.

Needed Strength

Power shovels and other earth-moving equipment were among the first structures to be fabricated extensively with EXX16 electrodes. Outstanding impact strength was a principal reason, for such equipment often works in bitterly cold weather.

When the temperature in arctic areas falls as low as -100 F, XX16 weld deposits, as Table I shows, are well above the 15 ft-lb recommended as the lowest design limit to insure satisfactory performance. Now, tough steels are assembled with even tougher welds to produce rugged equipment for extreme service conditions.

Nothwithstanding carefully planned welding sequences, complex heavy machine structures may break out with a rash of cracked welds caused by locked-up stresses. The greater strength and ductility of EXX16 weld metal has often gotten welding supervisors off the hook in such instances. Ductilities of "as welded" weld metal compares favorably with values found for the best of stress-relieved E6020-30 weld metal.

Outstanding properties of EXX16 weld deposits have led to the adoption of this electrode type for many previously difficult welding applications. Penetration is good; deposition rate is second only to the iron powder EXX24 and EXX27, and iron oxide EXX20-30 types.

Weld heads are flat to convex in the horizontal fillet position. X-ray deposits are sound when arc length is short and current is sufficiently high. Beads are uniformly good in appearance from beginning to end of the deposit length.

Neither undercutting nor cracking are apt to occur, and weld beads are somewhat coarsely rippled. All in all, the EXX16 electrodes produce weld deposits that stand up under the most exacting engineering requirements.

REFERENCES

Manufacturers catalogs;

Tentative Specifications for Mild Steel Arc-Welding Electrodes (AWS Designation A5.1-55T; ASTM Designation A233-55T), Mar. 7, 1955.

Tentative Specifications for Low Alloy Steel Arc-Welding Electrodes (AWS Designation A5.5-54T; ASTM Designation A316-54T), Dec. 22, 1954.

INDUCTION heating fixture melts preformed silver-brazing alloy clips on shroud ring and firmly joins 28 blade joints during 10-minute brazing cycle.

A 50% time reduction

Silver-brazing stator rings

AT ALLIS-Chalmers Mfg. Co. in Terre Haute, Ind., the use of automatic equipment for silver-brazing jet blades to engine shroud rings has cut production brazing time 50%. This equipment consistently produces high-quality joints. The defect rate is well under one per cent.

In this operation, inner ends of 28 nickel-steel blades are silver-brazed to semi-circular brass shroud rings. These rings form the stator stages of Curtiss-Wright J65 single-spool turbojet engines.*

This is the engine used in three F-84F's that won the 1954 Bendix trophy race and hold the cross-country speed record of 3 hours, 46 minutes. It is also used in six other military aircraft models.

Techniques Compared

Initially, before automatic induction heating units were received, these assemblies were brazed with hand torches. A comparison between the two heating methods points up some significant differences in production savings and joint quality when large numbers of joints must be brazed simultaneously.

The semi-circular assembly is composed of three components: an outer aluminum carrier ring; an inner brass shroud ring, and 28 nickel-steel blades. The outer end of each blade fits into a slot machined into the circumference of the carrier ring.

A nib on the inner end of each blade fits through a corresponding perforation in the shroud ring. It is this joint that is silver-brazed into a single, uniformly filleted, butt-and-pierced joint.

Two carrier rings are placed in a fixture composed of two half-circles and the blades are inserted in the slots. The operator slips a preformed silver-brazing alloy clip on the inner end of the blades. Semi-circular brass shroud rings are then fitted to the inner end of the blades.

Fluxing the Joint

The operator fluxes each joint, brushing the flux over most of the blade to prevent discoloration during brazing. The flux is kept ready in a heater at 90 F because warm flux spreads more easily and adheres better to polished surfaces.

Brazing is done on a high-frequency, 20 kw induction brazing unit. The completed assembly and its fixture is clamped into a circular holder mounted on grooved rollers on a panel in front of the induction generator.

The shroud ring rests against a three-quarter ring of asbestos-base material which supports the assembly. Heat is supplied by a stationary induction coil which couples to the front and rear of the blades.

Once the fixture is loaded, the brazing cycle proceeds automatically. On starting, the rotary fixture remains stationary for about 45 seconds of the brazing cycle until parts come up to proper temperature, approximately 1,170 F. The fixture then rotates the blade assembly slowly through the induction coils.

Smooth Fillet

As each joint passes through the induction heating area, the clip of silver-brazing alloy melts, joining blade end and protruding nib to the brass shroud ring in one solid joint having a smooth fillet of 0.030 to 0.150-in. radius.

The 28 joints are brazed in about 10 minutes. The completed assembly is then washed in a tank of soluble oil, maintained at 150 F, to remove flux.

Joints must withstand a specified minimum pull of 2,800 lb without fracture. Destructive testing is performed with a tensile machine on sections cut from production samples. The flange end of the table is held in one set of jaws and the section of shroud ring is held in the opposing jaws.

Jaws are designed so that the blade is not damaged during the test and can be re-used. Average joint strength obtained is twice the minimum requirement.

*See "Big savings in silver brazing," WELDING ENGINEER, Sept., 1955, p. 52.

AUTHOR reports on tests which indicate that carbon-dioxide-shielded Mig welds can fall below production standards if there is heavy moisture content in CO_2 gas.

Moisture in CO_2 gas: its affect on Mig welds

By R. W. Tuthill, *Supervisor*
Welding Process Engineering
General Electric Co.
York, Pa.

SOME of the deadliest enemies of the welding arc are air and water. Air is bad for the arc since nitrogen is present. Water, in turn, has hydrogen in it. Both of these gases tend to cause weld porosity and brittleness.

In metal-arc welding, one function of flux coating on an electrode is to exclude air from the arc area and to ionize the arc gap. But the bad affects of moisture in flux coatings on arc welding electrodes led to the development of low-hydrogen electrodes.

Economical gas-shielded welding of mild steel excludes air from the weld puddle by using carbon dioxide (CO_2) gas. It seemed logical, then, that moisture in this gas might also have a detrimental affect on weld results.

This reasoning led to an investigation of the affects of moisture in carbon dioxide gas when used as a shield for Mig (metal inert-gas) welding of mild steel.

The Nature of CO_2

It is important for the potential user of carbon dioxide gas-shielded welding to understand the nature of this gas. Commercial cylinders of CO_2 are different from those of other inert gases. Volume of a full tank is 68% liquid carbon dioxide; the other 32% is compressed gas. Cylinders of other inert gases are all gas with no liquid phase.

When the CO_2 flowmeter is turned on, gas is drawn from the top of the liquid at a rate which can be above the recovery rate of the tank. Therefore, gas above the liquid may be depleted unless two tanks are used in parallel for each arc.

When the tank is first used, pressure will be approximately 875 lb per sq in. at 72 F. Pressure will remain at this point so long as there is any liquid changing to gas in the tank. As the tank supply is depleted, more of the volume is gas and less is liquid.

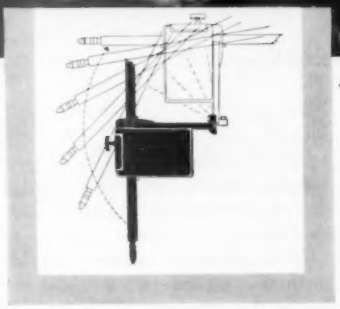
When all of the liquid turns to gas, pressure will begin to drop rapidly. The tank will hold maximum pressure for almost the full useful life of the tank. As soon as pressure begins to drop sharply, the tank should be taken out of use.

Special Regulators

It may be necessary, under conditions of high flow, to use either a special CO_2 regulator or supplementary heat to prevent regular flowmeters from frosting up with moisture inside and out. Expansion of gas through the regulator cools it, and room air may not keep the unit from freezing without supplemental heat.

One way to express the amount of moisture in a gas is to measure gas

This article is based on a paper presented before a meeting of the American Welding Society.



New Airco Model C Heliweld automatic head operates at all angles from horizontal to vertical.

Airco introduces New Automatic Heliweld Head for long-run production welding

The Model C Heliweld automatic head is specifically designed for long-run production on regular or irregular contours — aluminum tubing, motor stators, irregularly-shaped pressure vessels. Its prime advantage is that once the required arc length is set the head will automatically maintain this distance by moving the holder up or down to follow the contours of the work piece. Other benefits are:

- **Versatility** — unit provides good arc voltage control using either argon or helium shielding gases or mixture of both.
- **Adaptability** —the head can be operated at all angles from the horizontal to the vertical (normal) position. The maximum raise-lower distance of the electrode holder is a full 16".
- **Flexibility** — the assembly can be used for AC or DC welding, with or without filler wire. Electrode diameters range from .020 to ⅛".

The use of the new automatic head will be required where welds of consistent dimensions and quality are important and where good weld appearance is necessary or where welding specifications are very high for the electrical, aircraft, and refrigeration industries. Complete information covering the wide range of applications and detailed specification data is available. Write Airco at the first opportunity.

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temperature when the moisture present condenses. This temperature is called "dew point;" the larger the quantity of moisture in a gas, the higher will be the dew point.

Measuring Dew Point

A test installation was made to indicate and adjust the dew point in a shielding gas. Measurements were made of moisture content in several bottles of commercial, welding-grade CO_2. There was a wide variation between the high moisture, high dew point (—3F), and low moisture, low dew point (—43F).

A test installation was set up in the laboratory so that moisture could be added to dry CO_2 to produce a shielding gas having varying dew points. By using the tank with the lowest moisture content, and by bubbling a portion of the gas through water, it was possible to adjust the dew point from —43F to —90F.

Electrodes used in these welding tests were 1/16-in. in diameter, and had the following composition:

Element	Composition %
Carbon	.09
Manganese	.88
Silicon	.36
Aluminum	.01
Phosphorus	.015
Sulfur	.025

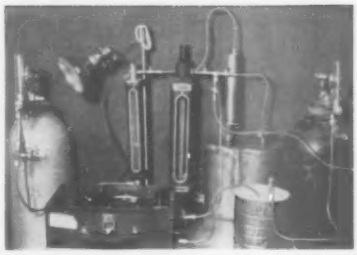
This electrode had proved to be satisfactory in previous tests comparing available electrodes.

Tested Specimens

With dew point varied over a wide range, all weld metal test specimens were prepared. High moisture content *did not* materially affect yield strength, hardness or ultimate strength. It *did* affect percent of elongation. Above —20F dew point, elongation dropped and readings became erratic and not easily duplicated.

Although the change in elongation was definite, there was a great deal of abnormality in the specimens at high-moisture points. X-rays of all weld metal specimens did not show wide variation in porosity, but porosity did show up in pulled specimens.

Exographs of welds made with varying amounts of moisture did not reveal any significant increase in porosity with increase in dew point. Spatter increased with the addition of moisture to the gas.



LEFT: This set-up indicated and controlled dew point during tests. Note lamp which heats regulator.

RIGHT: Water cooling of weld between passes was thought to be cause of this hole through weld in a compressor.

On the basis of these tests, an effort should be made to keep the dew point at —20F or below. The tests, made with commercial CO_2 grades, indicated that all tanks would not meet this requirement, although they do not appear to be very far from the desired value.

Holes in the Weld

Another affect noted in this investigation was a hole running vertically through the weld. The cause of this very obvious defect is not definitely known, but holes were observed from time to time on all weld metal specimens when plates were cooled after the second pass by dipping them in water.

Naturally, this was considered significant, and the practice of water cooling was discontinued. The holes were not observed again.

It is possible that high moisture concentrations may accumulate in the regulator by freezing (even though the gas used has a low dew point) if the regulator is not heated or if high flows are used. Resultant slugs of ice may break away from the regulator and enter the weld puddle.

Obvious Economy

This could cause holes if water is actually the culprit. Holes were not noted when plates were kept dry during cooling. *The lower the moisture content of the gas, the less chance there is for water to freeze in the regulator.*

Carbon dioxide costs but a fraction of one cent per cubic ft. Because of this obvious economy, the future of gas-shielded mild steel welding depends upon our ability to use this gas.

Certain techniques are required to apply this gas that differ slightly from those used with other inert gases. A very short arc is necessary, and arc length must be held constant to control spatter. High wire-feed speeds must be used to give current densities as high as possible.

Why do we desire constant arc length and not constant arc voltage? The manual arc weldor holds a constant arc length. He does not concern himself with voltage since he knows from experience that, if he holds arc length constant, he will control undercut, penetration, spatter and weld quality.

This inert-gas shielded welding method is no different than arc welding in this respect: that constant arc length is desirable, even on semi-automatic equipment. In order to get constant arc length with this welding method, it is imperative that a welding generator with rising volt-amp curve be used.

Since arc characteristics in this type of welding are rising, any constant-arc-length machine will automatically increase voltage required across the arc to hold a constant arc length for any specific wire-feed speed, requires re-setting if wire-feed speed is changed in order to hold a constant arc length.

Results of the tests indicate that moisture in carbon dioxide has an adverse affect on ductility of weld metal. However, yield and ultimate strength appears to be unaffected by moisture in the gas. Keeping spatter to a minimum by using dry gas is another factor of importance.

WEBB TANK PRODUCTION MACHINERY

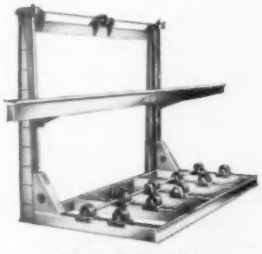
REED OFFSETTER

This machine forms an offset flange around shell ends to facilitate automatic welding of tank heads. It eliminates chill rings, decreases fit-up time, improves the concentricity of shell ends, and aids in reducing actual welding time. Tight, clean joints result. Three sizes of Offsetters handle up to ½" plate with standard dies. Illustrated with Turntable for reversing shell ends when both ends are to have offset flanges formed.

REED ASSEMBLY PRESS

Permits rapid fit-up of tank heads into tank shells where offset joggle joints are used. Hydraulic pressure is applied through ball-and-socket swivel joints that allow the head cups to set to the head. Hydraulically powered kick-outs speed up loading and unloading. Both headstock and tailstock are adjustable vertically; tailstock is also adjustable along the bed for various lengths of vessels up to 18'.

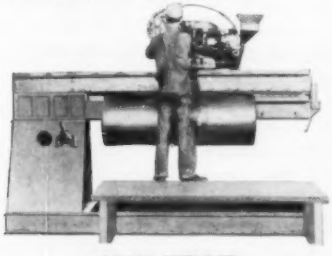
Fit-up rolls are also available to facilitate proper alignment and assembly of shells lacking rigidity.



UNIT TYPE ROLL

A complete line of Unit Type Track Supports and Turning Roll Fixtures can be provided for the welding of longitudinal and girth seams of cylindrical vessels, to 12' in diameter and weighing up to 9 tons.

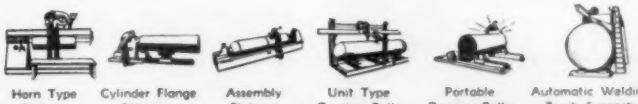
The unit is of all steel construction and all critical surfaces are machined to insure accuracy.



SEAM WELDER

These fixtures are widely used for single pass automatic longitudinal seam welding, using closed butt joints. This is designed primarily for cylindrical shapes and will also handle flat work and conical shapes. The material is clamped firmly in the jig in contact with the water cooled back up bar.

Machine is of all steel construction.



Horn Type Fixtures | Cylinder Flange Offsetters | Assembly Fixtures | Unit Type Turning Rolls | Portable Turning Rolls | Automatic Welding Track Supports

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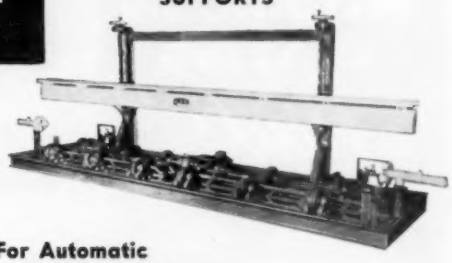
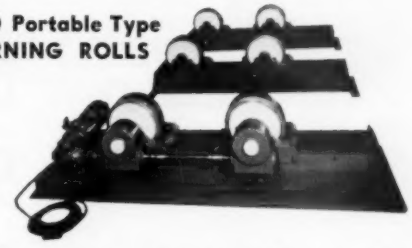
REED TRACK SUPPORTS



For Automatic Welding Head Carriages

Increase production—use this fixture on 4' to 12' diameter work. Welding track is 24' to 34' long. Powered vertical adjustment is available for all models. May be used with your present turning rolls, welding positioners, special jigs for straight seam work, or portable type rolls illustrated below.

REED Portable Type TURNING ROLLS



For manual or automatic welding and other operations requiring rotation of a cylindrical vessel. Capacities range from 3 tons to 75 tons; larger units built to special order. Powered by electric motor with variable speed transmissions. Readily portable, they may be used free or anchored to the floor as desired.

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WELDING and BRAZING Hints

PROBLEM:

To weld cast iron

SOLUTION:

Airco #9 Cast Iron (square). This is a high quality, grey cast iron welding rod commonly used for oxyacetylene welding of cast iron. It assures easy weldability and will produce soft machinable deposits when used with correct pre- and post-heating procedures.

Airco #10 Moly-Cast Iron (square). Deposits obtained with this rod are stronger than those from standard cast iron rods. Recommended for welding alloy cast iron and for building-up worn areas on diesel engine cylinder heads. This rod may be used for welding alloy cast iron of the same or different analysis providing the base metal does not contain ingredients to produce some special characteristic such as corrosion resistance.

Atlas Cast Iron Welding Flux. This flux has a lower specific gravity than cast iron, thus floats out the oxides and impurities to assure sound cast iron weld metal. To expedite the job, sprinkle some of this flux over the joint and the molten puddle.

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You'll find here the finest rods and fluxes for joining both ferrous and non-ferrous metals. Write Airco at address below.

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LEFT: Worker uses eyedropper to place two drops of solder paste on each cast setting.

RIGHT: Bracelets are positioned on settings and pressed onto solder paste. Joint area is very wide.

New solder gives costume jewelry a lift

By Herbert Drapkin
Chief Engineer
Anchor Metal Co., Inc.
Brooklyn, New York

FOR MANY years, prime bottlenecks in the manufacture of costume jewelry were the high cost of soldering, rejects caused by discoloration or melting of base metal due to excessive torch heat, and unsightly solder lumps and spatter that were difficult to remove.

Since the costume jewelry business is extremely competitive, with low retail prices an important factor, these problems often increased the per-item cost to a point where the selling edge was lost.

Recently, however, increasing numbers of costume jewelry manufacturers have been discarding manual soldering methods for a more profitable production line operation. One firm, the Gay Novelty Co., Inc., of New York City, has coupled a new liquified solder paste that can be applied in minute amounts with induction heating.

The result has been a 60% increase in output of costume jewelry parts and sharply reduced labor costs. It is now possible for the manufacturer to produce quality products at low cost since combinations of jewelry metals with widely varying melting points can be used without danger of base metal damage.

Production Rates

In manually tack soldering bracelet chains, five highly skilled solderers using torches turned out a maximum of 10 gross per hour. A large percentage of these were rejects.

With the new automatic system, four unskilled workers set up the parts to be soldered and one skilled worker operates the induction heating machine. These five workers can turn out 16 gross of soldered bracelet chains in one hour, without any rejects and with parts so neatly soldered that the joints cannot be detected.

Stone settings for costume jewelry are cast in vulcanized rubber molds and/or brass dies. Liquid casting material consists of either a tin base (white metal or britannia), pewter, or slush (basically lead).

Cast settings, in unlimited geometric design, are in turn soldered

to such products as bracelets, earrings, pendants, brooches and similar ornaments. Metals to be soldered include white metal to brass, white to white metal or brass to brass

Soldering these materials by hand required a high degree of skill with a torch using a natural gas and compressed air mixture. The worker held the flame on the solder just long enough for it to melt, an inefficient method that failed to distribute heat evenly throughout the base metal and subsequently resulted in joint failure.

Soldered Settings

How production problems were solved is well illustrated by the procedure used to solder cast settings to bracelets.

On a bench in front of each of four set-up workers are two boxes, one with settings, the other with bracelets. Settings are placed on a flat asbestos sheet, ½ in. thick, which has pre-formed depressions molded in the shape of the settings. In this case, there are enough spaces for forty triangular settings, four to each bracelet.

With all settings in place on the sheet, the worker fills an eye-dropper with free-flowing, liquified solder paste and deposits a tiny drop at two tacking points on each setting.

This joining material consists of a high-strength, tin-lead solder and flux in a suspension agent that prevents the mixture from drying out.

Ten bracelets are positioned on top of the settings and pressed down on the solder paste. The entire assembly is then placed on an 8-in. conveyor belt that leads into a 3-kw induction heating machine.

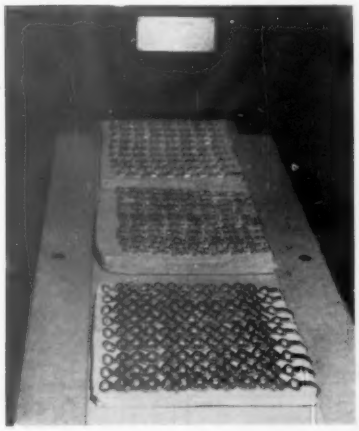
Controlled Heat

This unit applies heat electronically, and is controlled by a rheostat that can easily be adjusted to any desired temperature, depending upon metal pieces to be joined.

As the bracelet assemblies pass beneath induction coils, metal parts are heated to the low melting point of the solder in a production cycle that takes approximately three minutes. Despite the minimum amount of solder paste applied, tacks are strong. They cover a wider joining area than formerly, and there is no need to clean them.

There are many advantages to the new method. Rejects and discoloration have been eliminated; production has been increased, and designs that previously required one-piece metal castings or costly brass findings (ear wires or ear clips) can now be produced at minimum cost.

According to one costume jewelry manufacturer, "this new production method has definitely licked a problem that plagued the industry for many years."



LEFT: Conveyor carries assembled settings and bracelets into 3-kw induction heater.

RIGHT: Any shape of setting can easily be manufactured using new solder paste.

"Presto"! SAFE!!

Here's **Automatic** Safety

Here's the most practical and pleasing approach to the problem of eye protection **at all times** for welders—the patented Sellstrom **"PRESTO"** Shield!

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This handy protective shield can be applied to all of the standard Sellstrom welding helmets. Another good feature—it's extremely light weight—adds only about an ounce and a half to the total helmet weight.

These light weight, low-cost "PRESTO" Shields are available in green or clear, with or without leather sweatband. Replacement windows are also available.

Write for brochure which gives complete information and prices on the "PRESTO" Shields, or send for Catalog No. 32 for full information and prices on Sellstrom helmets, respirators, goggles and other Safeguards.

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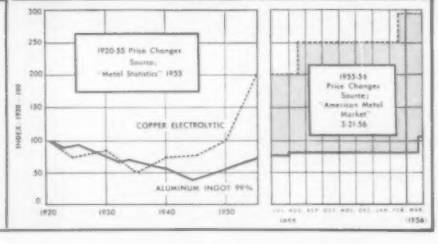
1 LIGHTWEIGHT to reduce fatigue! Aluminum welding cable is only about one-half the weight of copper welding cable. Thus, it's *twice* as easy to lift and drag around—an important factor in reducing fatigue and increasing efficiency on the job.

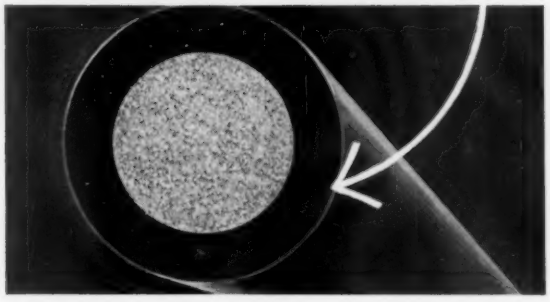
ECONOMICAL! The favorable price of aluminum, when compared to copper, provides important economies. And you continue saving money *even* when you specify aluminum one or two AWG sizes larger than copper to offset its slightly less amperage carrying capacity.



ALUMINUM WELDING CABLE!

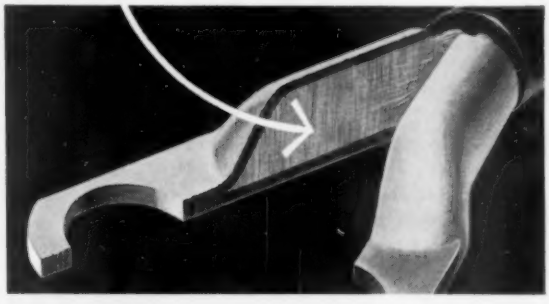
the weight of copper cable—plus other important benefits!

2 EXTREMELY FLEXIBLE to make work easier! The fine wires used for aluminum welding cable assure *maximum* flexibility, plus toughness and durability. Aluminum welding cable can easily be looped into a circle with thumb and forefinger—demonstrating the freedom of movement it provides to the weldor.



3 DURABLE to withstand hard use! Tough rubber jacket resists abrasion, acids, sunlight and heat. For extremely hard usage, a neoprene jacket is available which offers maximum resistance to abrasion, acids, alkalies, grease, oil, sunlight and heat. In addition, the neoprene jacket is flame-resistant.

4 COOLER to make handling more comfortable! Aluminum welding cable dissipates heat almost twice as fast as copper cable of similar size. As a result, the aluminum cable and electrode holder is far cooler and more comfortable to handle.



5 EASY TO SOLDER for tight copper or brass terminals! Terminal lugs or accessories can be soldered to aluminum welding cable by a simple 4-step method: 1) heat socket or lug barrel with small torch flame, 2) apply non-zinc chloride type flux inside barrel, 3) insert soldering wire while applying heat, and fill ⅔ full, 4) gently work stripped end of cable into solder socket, remove flame, and allow to cool. Connection is then ready for use. Aluminum welding cable also takes good mechanical connections.

Kaiser Aluminum is a leading producer of electrical conductor for transmission, distribution and service drop lines. In addition, Kaiser Aluminum produces building wire and other aluminum conductor products for industry.

At your request, we will be glad to send you our informative folder, "New Advantages in Arc Welding Cable with Aluminum Welding Cable." Write to Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois; *Executive Office*, Kaiser Bldg., Oakland 12, California.

* * *

To take full advantage of new aluminum welding cable, contact your welding equipment manufacturer or your nearby welding supply distributor. Aluminum welding cable is produced for equipment manufacturers by Kaiser Aluminum at the company's Newark, Ohio wire and cable mill.

Kaiser Aluminum

WORKING within canvas windbreak, operator Tig welds a joint in aluminum cable sheath.

Aluminum cable cover joined by Tig method

BY J. C. KALUZNY and C. E. O'ROURKE*

THE RECENT installation by Niagara Mohawk Paper Corp. of the world's first insulated power cables with aluminum external covering and welded joints was made possible largely by the ability of the Tig (tungsten inert-gas) process to join aluminum sections successfully.

Normally, power cables such as those installed by Niagara Mohawk in North Tonawanda, N. Y., are covered with lead. Experiments have shown, however, that use of aluminum as a cable sheathing is more desirable and more satisfactory.

The use of aluminum sheathed cable with lead wiped joints resulted in separation of the two metals under aging and stress, and permitted weather erosion of the cable core.

Use of aluminum for cable sheathing, however, had previously presented difficult welding obstacles. It was almost impossible to effect satisfactory juncture at temperatures needed to weld aluminum without damaging insulating materials around copper conductors inside.

By developing special joint designs and weld procedures adaptable to the Tig process, the company's engineers and technicians have now overcome this and other problems ordinarily encountered in welding aluminum. As a result, high strength weld joints with excellent resistance to both fatigue and weathering have been produced.

USING argon as a shielding gas and a ⅛-in. electrode, Tig welding progressed rapidly with no heat damage to insulation.

The subtransmission lateral circuit on which the cables are employed extends 6,000 ft along city streets of North Tonawanda, located between Buffalo and Niagara Falls.

Built to meet AEIC specifications, the cables are three-conductor, paper-insulated, solid types. Conductors are 350 mcm (circular mils) compact-sector copper with 240 mils of shielded, impregnated paper on each conductor.

Metallized paper tapes are provided at each conductor surface. The impregnating oil is of normal viscosity. A 110-mil-thick aluminum sheath is placed over the core, leaving a 10-mil space between core and sheath. Outside diameter of the cable is 2.52 in. and weight of cable is 6.7 lb per foot.

Cable was purchased in reel lengths of 1,000 ft and was installed in these lengths. Cables are suspended from messengers (7/16-in.-diameter, seven-strand, Class C galvanized steel) by 20-mil, ¾-in.-wide stainless straps spaced 10 ft apart.

The stainless straps used are compatible with the 2S and 3-in. aluminum alloy cable sheath, and attain an ultimate strength of 800 lb.

Testing Samples

When it was decided to join sections of the cable sheath by welding, extensive experimentation was conducted with both wiped and welded samples. Use of wiped joints resulted in breakdown, but welds made with the Tig process proved capable of standing up under all forces of expansion and contraction.

To complete welding, a staged platform covered by a canvas tent enclosure was constructed, providing both weather protection and screening for the gas-shielded welding process.

A 400-amp a-c welder and water recirculating unit were mounted on a line service panel truck. Hose and welding cables were run from the truck to a terminal board on the welding platform above. An electrode holder was then connected to this terminal board.

Insulation Achieved

The welding process required that cable impregnate (oil) be kept off surfaces to be welded. Welding heat also had to be insulated to prevent damage to insulation.

Both objectives were served by sliding a 4-mil-thick metal shield between sheath and core, and by packing several strands of dry asbestos

*Air Reduction Sales Co., Buffalo, N. Y.

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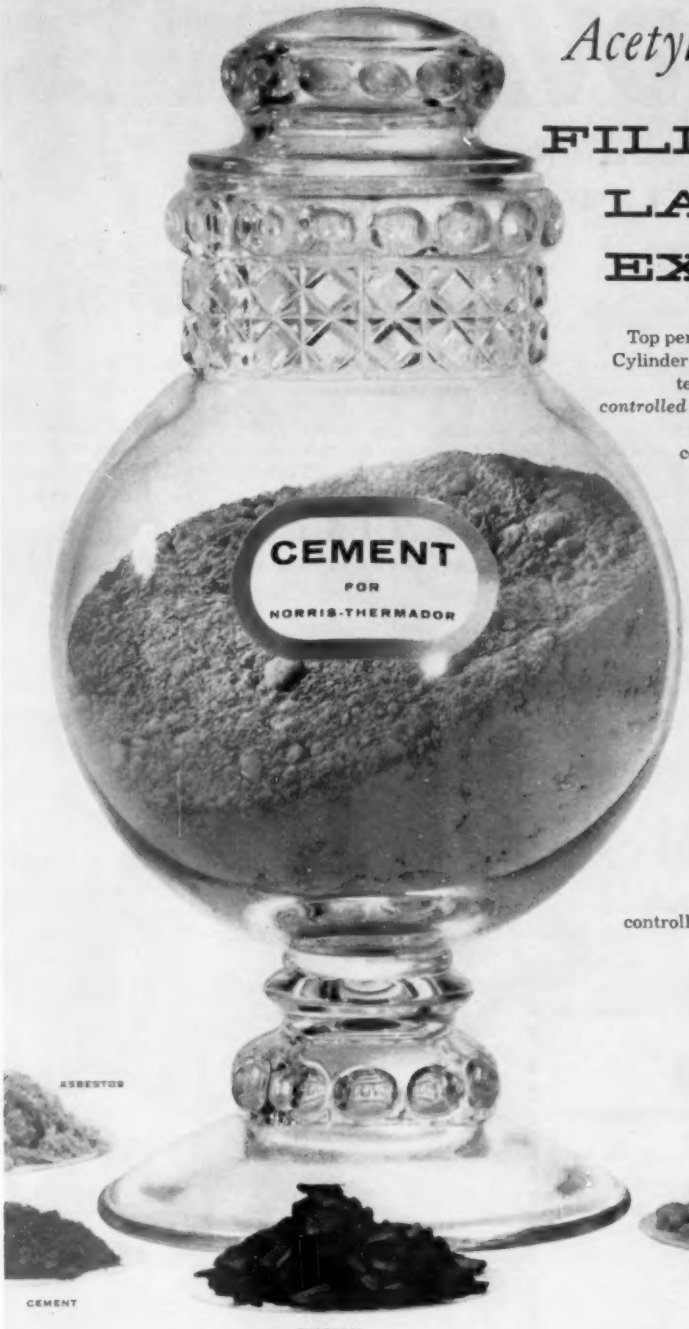
FILLED WITH LABORATORY EXACTNESS



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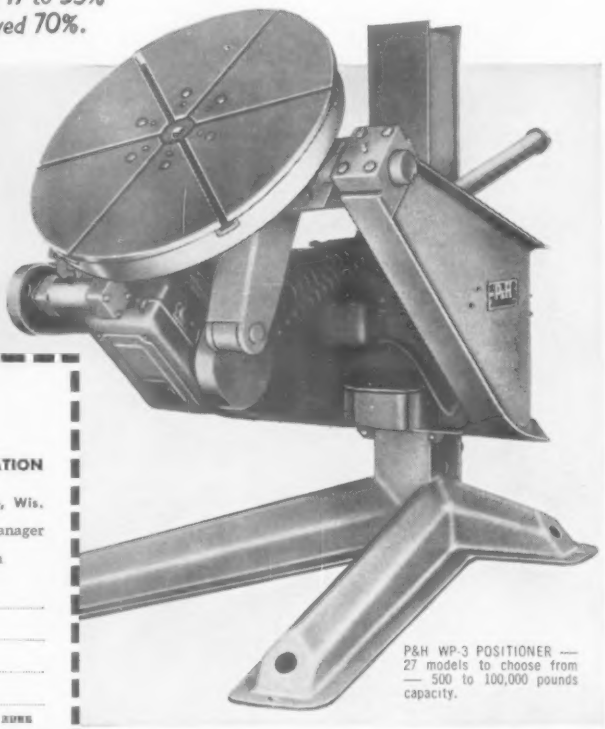

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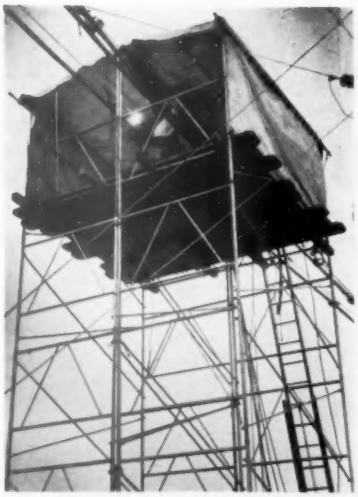

TENT high atop scaffold provided necessary shelter for weldors on sheathing job.

string between sheath and metal shield. With this procedure, both paper binder and insulator were unaffected by welding heat.

A wet rag for additional cooling was placed on the cable sheath during welding. The first welding operation was that of welding end bells to the flared cable sheath.

This was followed by an internal cable splice. The sleeve was then welded to the end bells with a lap joint. All welds were started at the bottom, and the bottom half of the cable assembly was welded as soon as possible to keep the oil impregnate under control and away from the weld area.

It is felt that the aluminum sheathed aerial cables present a new and very promising method of construction for transmission circuits. Their lighter weight and excellent resistance to vibration fatigue have made their use possible where lead sheathed cables would have been impractical.

Additional field experience and satisfactory performance of this particular installation will undoubtedly promote a more general use of aluminum sheathed cables.

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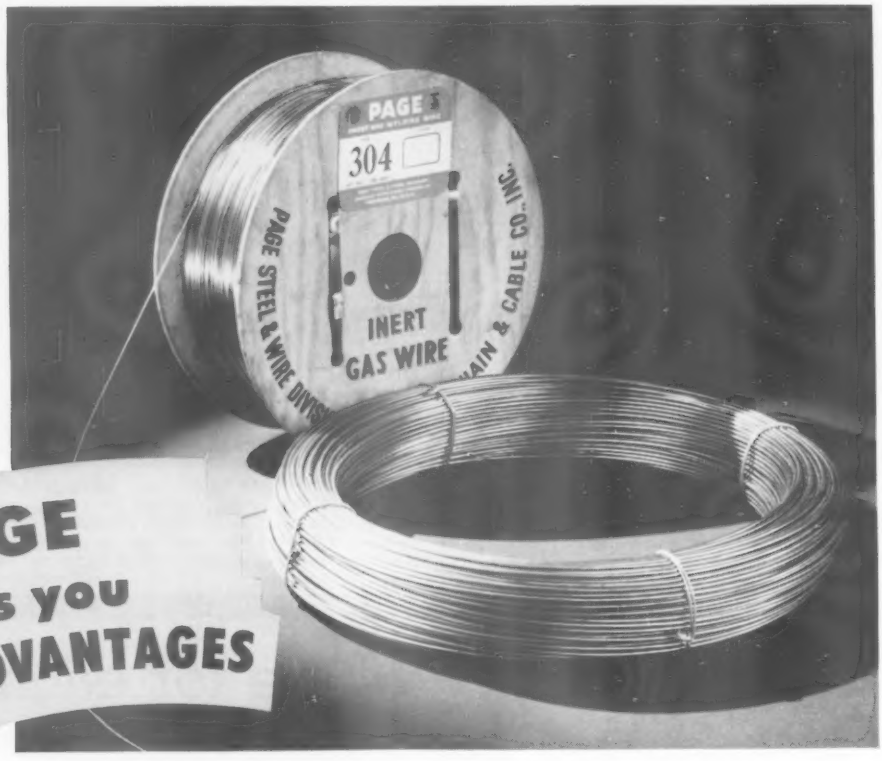

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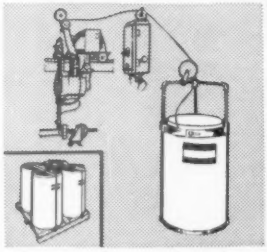

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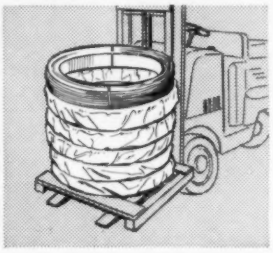

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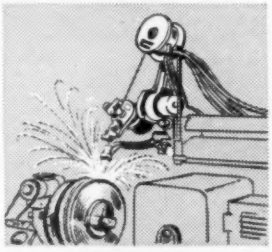

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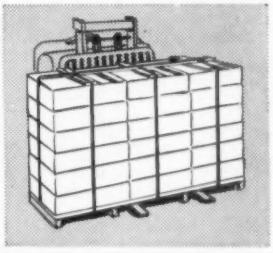

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Get the full Analysis List

All the 26 analyses of PAGE Automatic Welding Wire are set forth in complete detail in new Folder **DH-402.** A free copy of this informative folder will be sent on request. Write our Monessen, Pa., office.

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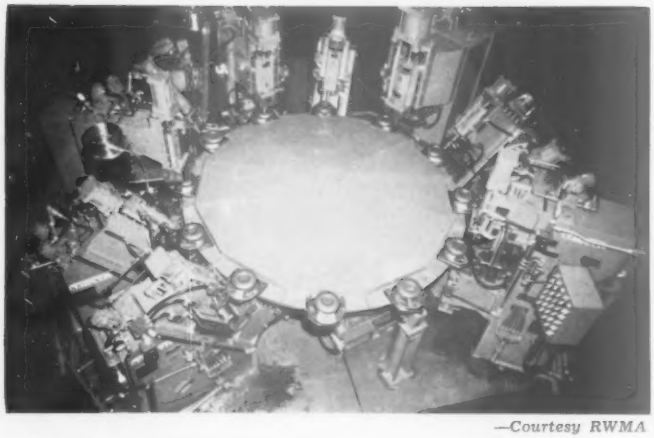
STEEL pipe for West Haverstraw, N. Y., ice rink was fabricated by manual arc welding. Pipe in sizes from 1 to 12 in. was used; shut-off valve system allows spot control of ice temperature. Weldor here joins headers at step-down point. Rink operates from October till April 15.

on the job . . .

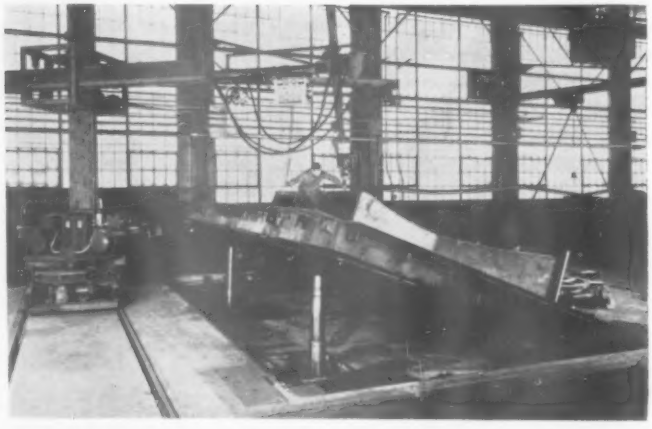


—Courtesy RWMA

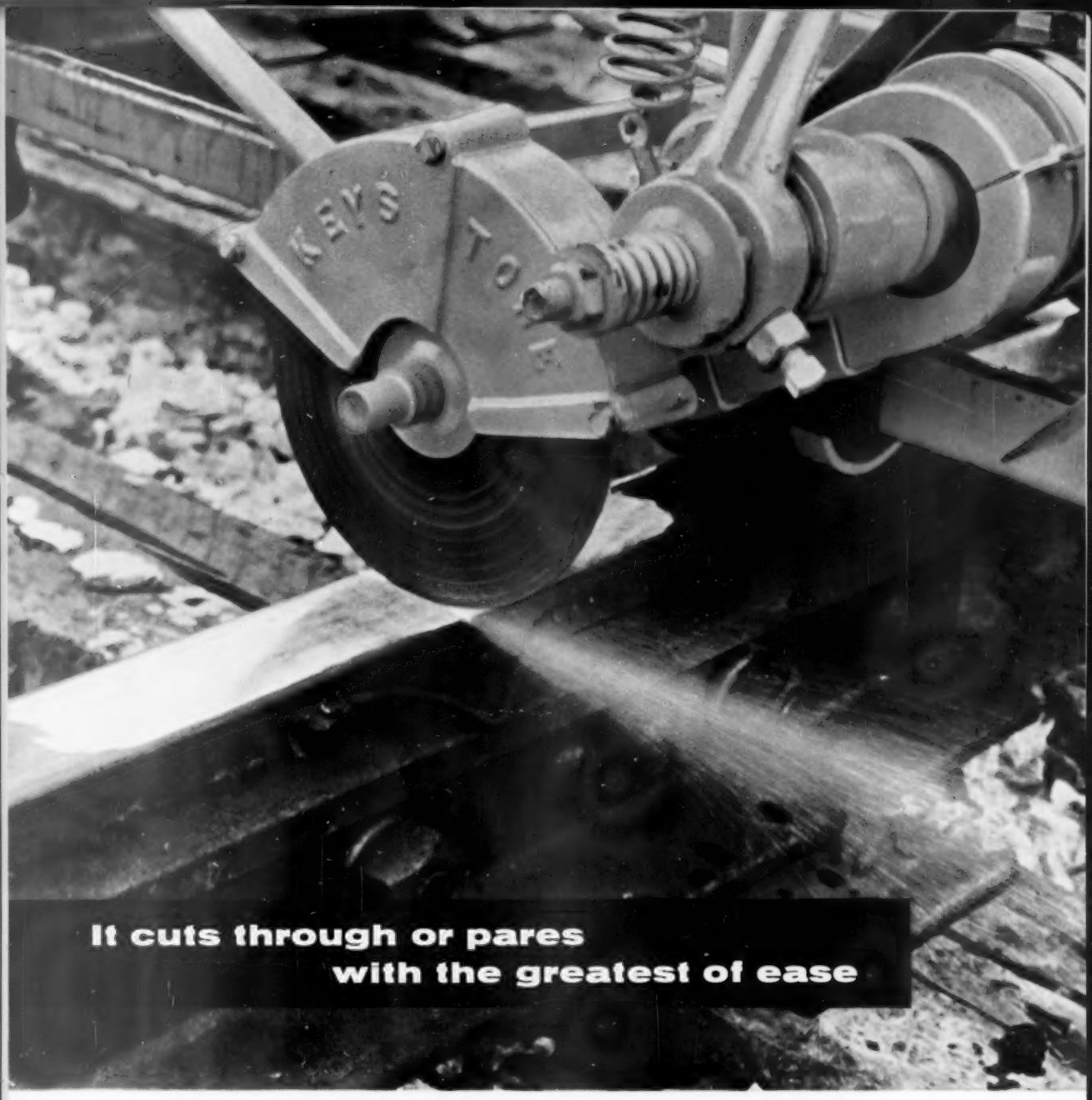
ELECTRIC refrigerator manufacturer uses automated group of 10 resistance welding machines to weld connecting fittings and bushings to upper shell of refrigerator compressor. Positioner, 100 in. in diameter, indexes every 10 seconds and stops for welding application on 10-part shells. Machines use a total of 880 kva; complete installation weighs about 30 tons.

—Courtesy Wall Colmonoy Corp.

CAST iron cable conveyor buttons used in paper industry are hardfaced for additional service life. Non-magnetic, chromium-boron-nickel alloy is applied by reverse polarity current at 140/160 amp. One pound of alloy hardfaces 7 of these 30-lb buttons.



TILTING floor is used with automatic welding head manipulator at new Worthington Corp. welding research laboratory, Harrison, N. J. Floor table is 18 by 33 ft and weighs 65,000 lb.



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SIMPLY CHECK THESE QUESTIONS . . .
. . . AND YOU'LL HAVE THE ANSWERS

- ☐ Do the Holders you buy have Wrap-around Glass Fiber Insulation for 30% **more** heat resistance than any other make?
- ☐ Do they have the safety value of Brilliant Red Glass Fiber Tips and Trigger with bright yellow Glass Fiber Handle for instant identification anywhere in plant?
- ☐ Are the Tip Insulators made from high impact Glass Fiber with top and bottom interchangeable to reduce stock requirements and maintenance costs?
- ☐ Is the body of the Electrode Holder completely insulated, or is there a bare spot **between** spring and trigger?
- ☐ Do they have the safety value of Brilliant Red Glass Fiber as well as insulate glove from the heat?
- ☐ Do they have high conductivity copper in lower tong to carry away inducted heat from rod, as well as high electrical conductivity?

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HI-AMP Model	Rated Amperage	Rod Size	Weight	Lots 1-5	Lots 6-11	Lots 12-49	Lots 50-99	Lots 100-249	Lots 250-Up
F-2	200	5/32" to 1/16"	12 oz.	4.50	4.05	3.85	3.65	3.45	3.30
F-25	250	1/4" to 1/16"	14 oz.	5.50	4.95	4.70	4.45	4.25	4.05
F-3	300	5/16" to 3/32"	21 oz.	6.00	5.40	5.15	4.90	4.65	4.40
PI-5	500	5/16" to 3/32"	26 oz.	7.50	6.75	6.40	6.10	5.80	5.50

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Weld with Wagner

GROUP photo of new NWSA officers and directors. For further identification, see text.

Annual NWSA Convention

Bigger and Better

By F. T. Tancula

IT BECOMES increasingly difficult to chronicle events in the welding world without using that familiar refrain, "new records were set." With the rapid growth of our industry, records never seem to last more than one year.

So it was in New Orleans.

The site may have had at least a little to do with it, but whatever the reasons, the National Welding Supply Association's 12th annual convention, held March 19-22 at the Roosevelt Hotel, drew an all-time high attendance of 759 persons.

On hand to participate in the social events and garner information on widening the margin of profit were 501 men and 258 women.

Stillwell Elected

Elected president for the coming year was Charles O. Stillwell, Gulf Welding Equipment Co., New Orleans. He succeeds Ed Caluwaert, O.K.I. Welding Supply Co., Cincinnati. Mr. Stillwell had served as chairman of the convention committee for the highly successful meeting held in his home town.

Serving under him for the ensuing year will be the following vice-presidents: Al Earlbeck, Earlbeck & Landrum, Inc., Baltimore, Eastern zone; Herbert G. Weiler, Weiler Welding Co., Inc., Dayton, Central zone; R. S. Mars, Jr., W. P. & R. S. Mars Co., Duluth, West Central zone; Leslie P. Beaver, Jr., Beaver Welding Supply Co., Memphis, Southeastern zone; J. R. Stewart, Hill Equipment & Supply Co., Dallas, Southwestern zone; and W. H. Stanfill, Welders Supply Co., Portland, Ore., Western zone.

The following four members were elected to serve on the board of directors until 1959: R. Dudley Layman, Layman Welding Supply Co., Grand Rapids, Mich.; Bob Toll, H. R. Toll Co., Minneapolis; V. B. Anderson, V. B. Anderson Co., Santa Ana, Calif.; and Charles A. Dinsmore, Dinsmore & Co., Ltd., Montreal.

Some Put Into Trance

Other than the ladies' program and tours of the city, social highlights were the president's reception on Monday, the barbecue dinner at the New Orleans Country club on Tuesday, and the reception and banquet on Wednesday. Entertainment at the banquet was provided by Edward Barron, a hypnotist who demonstrated the ease with which some persons can be mesmerized.

This year's Contact Booth program, held in the hotel on Tuesday and Wednesday afternoons, was another "record," with 106 manufacturers participating.

The idea exchange of the meeting was a panel discussion on "Cost cutting methods we have adopted." W. P. McLendon, Keenan Welding Supplies Co., Albany, Ga., described his firm's office economies. Glenn Garman, Purity Cylinder Gases, Inc., Grand Rapids, discussed credit economies. Warehouse economies as practiced by his company was the topic of R. S. Mars, Jr., and Harry Moore, Moore's Welding Supply, Sacramento, Calif., spoke on selling economies.

Business Morality

"Ethical standards are a cornerstone of American business . . . and what is legal isn't always moral," was the gist of a talk by G. Robert Gadberry, assistant vice-president of The Fourth National Bank of Wichita, Kans. Describing this nation as a "20th Century Samson" whose strength is being sapped by indolence, Communism and other "Deli-

MORAL aspect of American business was discussed by G. R. Gadberry.

OLD and new. Ed Caluwaert, left, outgoing president, extends hand to Charlie Stillwell, NWSA president for 1956-57.

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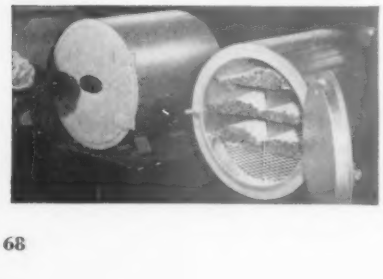

SPEAKERS at last session were, from left, William Gove, Mary Gordon and Frank Lovejoy. Miss Gordon and Mr. Lovejoy are scanning copy of THE WELDING DISTRIBUTOR, new sister publication of WELDING ENGINEER.

lahs" of our time, he reminded his listeners that freedom is not free, but priceless.

"It is all right to widen the margin, but don't lower the standards," he admonished.

A. L. Makle, The California Co., New Orleans, reiterated the theme of the convention, "Widen the margin," by his discussion of economies in operation and the importance of cost control.

Gene Flack, Sunshine Biscuit Co., Long Island City, N. Y., in a speech larded with anecdotes, extolled the virtues of optimism. "Where confusion reigns, there is pessimism," he said.

Be a "Go-Giver"

On the last day of the convention, members heard from three guest speakers. Mary Gordon, TransWorld Airlines, gave travel tips and demonstrated the proper packing of a suitcase. Frank W. Lovejoy, Socony-Mobil Oil Co., New York City, in a speech entitled "The price of the best is always the rest," stressed the importance of merchandising.

"*You* make the difference" was the theme of William H. Gove's talk. Vice-president of EMC Recordings Corp., St. Paul, Mr. Gove listed three prime attributes of a good salesman: be yourself, be a good listener, and remember *service*. Pertaining to service, he reminded NWSA members that "you have to be a go-giver as well as a go-getter."

During the business sessions of the convention, it was revealed that NWSA membership stands at an all-time high. During the convention, it totaled 521 members, an increase of almost 20% over last year.

Applications for memberships were received from the following 13 firms during the meeting:

Active—Williams & Timmerman Welding Supply Co., Duluth; Lake Charles Pipe & Supply Co., Lake Charles, La.; Crescent Welding Supply Co., Inc., Gretna, La.; Middle Georgia Oxygen Co., Macon, Ga.; National Welding Supply Co., Mobile, Ala.; Niagara Welders Supply Co., St. Catherines, Ontario; National Welding Supply, Inc., Albert Lea, Minn.; Pemion Welding Supply Co., Inc., Odessa, Texas; Prevost Supply Co., Anderson, S. C.; and Shaw Oxygen Co., Monroe, La.

Associate—M. L. Weed & Co., Dallas; Welding Materials Mfg. Co., Fitchburg, Mass.; and Elmet Division, North American Philips Co., Inc., Lewiston, Me.

To assist Robert C. Fernley, who will now function as executive secretary-treasurer, the organization appointed H. Donald Richards secretary. The move was made upon recommendation of the budget and finance committee because of the increased membership and corresponding added duties.

Next: Washington, D. C.

Next year's convention has been scheduled for May 13-16 at the Hotel Mayflower, Washington, D. C. Dates and sites for the six zone meetings:

Eastern zone—Sept. 20-21, Hotel Statler, New York City.

Central zone—Sept. 24-25, Hotel LaSalle, Chicago.

West Central zone—Oct. 29-30, Hotel Nicollet, Minneapolis.

Western zone—Nov. 1-2, St. Francis Hotel, San Francisco.

Southeastern zone—Dec. 3-4, Dinkler-Tutwiler Hotel, Birmingham.

Southwestern zone—Dec. 6-7, Hotel Statler, Dallas.

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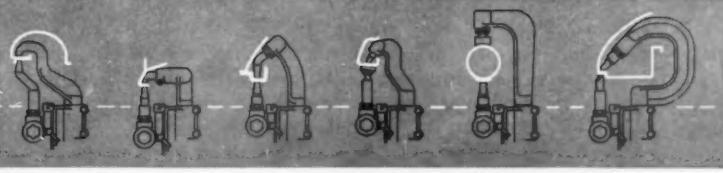

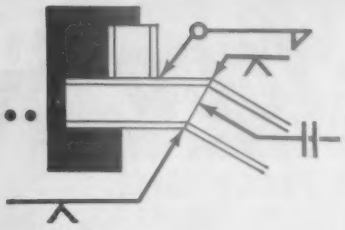

the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Weldability of casing pipe

Question:

Is it possible to weld J-55 and N-80 casing pipe (API standards) without preheating, and could the same electrode type be used efficiently for both applications? We learned from one of the few pieces of literature available to us on this subject that it was possible to use an E7010 electrode on API grade "C" or "D" casing—is this correct?

Answer:

Classification of casing pipe, according to API Standard 5A, is based on yield and tensile strength rather than chemistry specifications. The N-80 casing, for example, has a yield strength of 80,000 psi.

However, although there is a chemistry specification only for sulphur and phosphor and not for carbon or manganese in either casing type, it is possible to obtain a carbon analysis of 0.30 to 0.45% and a manganese analysis of 1.0 to 1.25% in the N-80 casing.

In view of this fact, preheating will be necessary in welding N-80 casing pipe. There is the possibility that carbon and manganese content may be unusually high, causing air hardening in the heat-affected zone adjacent to the weld. Without preheat, cracking may result.

Electrode Selection

Since the J-55 casing has a lower yield strength—55,000 psi—it may conceivably be welded without preheating. Here again, chemical analysis will have to be the determinant. If carbon content is above 0.30%, the J-55 casing pipe will have to be preheated to avoid cracking.

The electrode chosen for a welding application on casing pipe should be a low-hydrogen type, and it should also have the same tensile strength as the material on which it is used. For example, an E7015 or E7016 electrode could be recommended for use on the J-55 casing pipe. For the N-80 casing application, an E10015 or E10016 would be in the same tensile strength classification.

Preheating may very likely fall in the range from 200 to 400F, but the exact temperature will depend on chemistry analysis and the electrode type desired.

The casing grades mentioned in the queston may apply to drill pipe, which API lists under C, D and E grades. Grade C has a yield strength of 45,000 psi, and a 75,000 psi tensile strength. Grade D has a 55,000 psi yield strength, with a 95,000 psi tensile strength.

Welding is Restricted

Drill pipe in the grade C category could be welded with an E7010 electrode if the carbon content is below 0.30%. The D grade pipe, however, would require both preheat and an electrode with high tensile strength, *i.e.*, an E10010, E10015 or E10016.

API Standard 5A, which lists specifications for casing, drill pipe and tubing, does not permit arc welding repair of defects in this material that exceed 12.5% of wall thickness. Observance of this restriction would naturally limit the welding of casing pipe, particularly when dealing with the higher strength materials.

As you have noted, there has been very little information compiled recently on the weldability of casing pipe.

Question:

Our shop has to repair many magnesium castings, and we have encountered difficulty both with thin-walled sections and with holes created when small pieces broke away. Can you tell us the best method of handling these castings?

Answer:

Clean and position the damaged casting. Set the broken pieces in place over a heat-resisting plastic material which can be molded into any desired shape. This mold hardens when it comes into direct contact with flames, but the remainder of the material remains pliable for future use.

Joint areas should be fluxed and broadly heated. When flux melts, apply a magnesium welding rod. This extremely thin-flowing alloy will penetrate joints quickly and thoroughly without the application of an excessive amount of heat.

The putty-like packing material will harden underneath broken areas and hold the molten alloy in place as it fills holes and cracks. When the alloy has solidified, very little grinding should be necessary for a smooth finish.

In addition to its use as a back-up for repairs, the packing material can also be used to protect certain critical areas from torch heat, and to serve as a mold when a build-up is necessary.

—Courtesy Eutectic Welding Alloys Corp.

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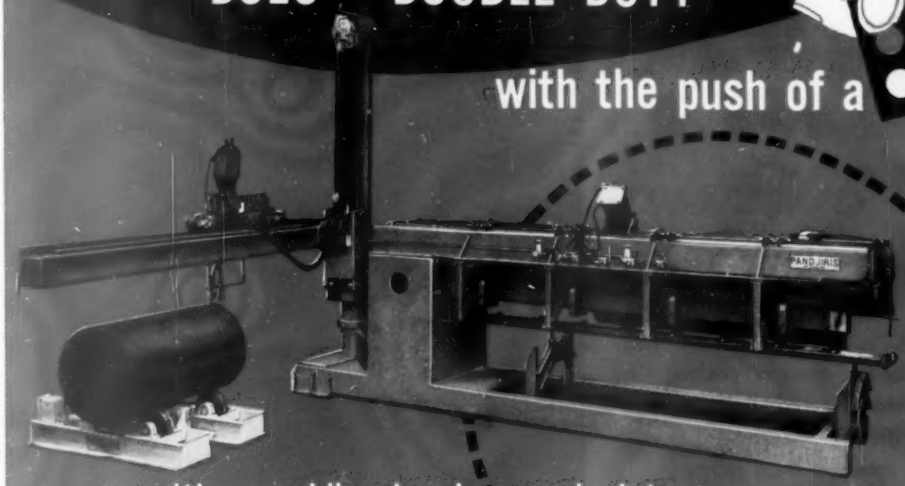

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The boom rotates 360° in horizontal plane with power elevation . . . to handle a wide variety of jobs at various stations with one automatic head.

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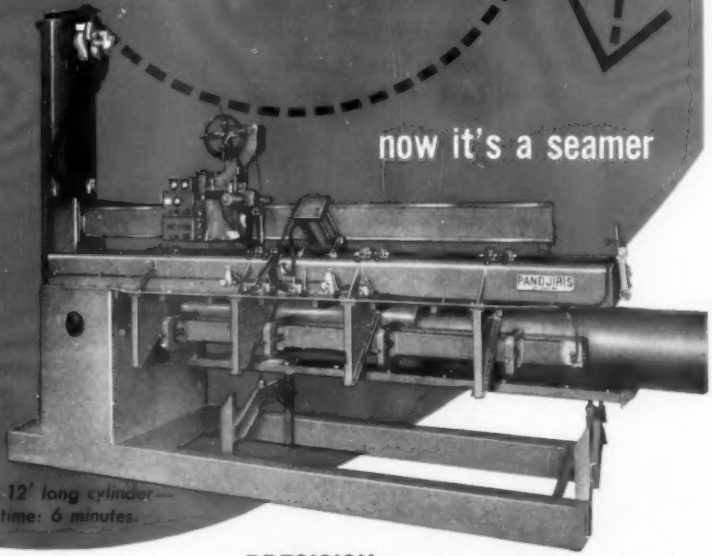

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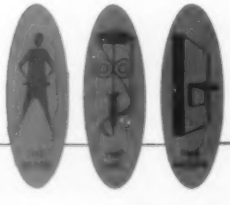

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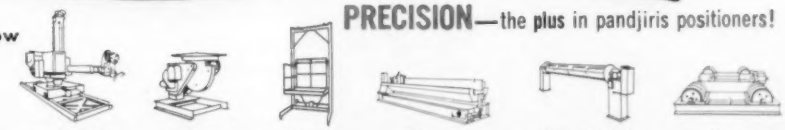

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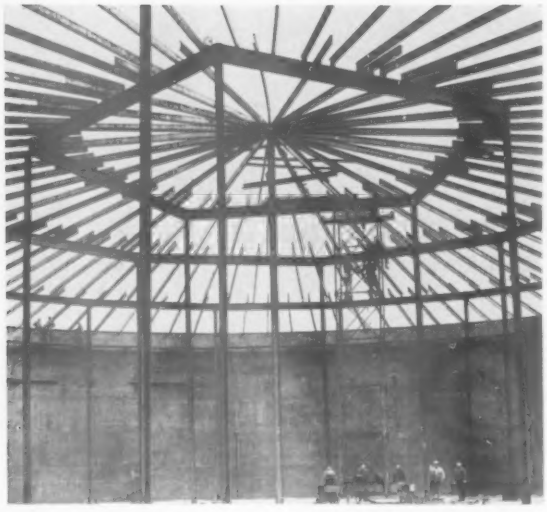
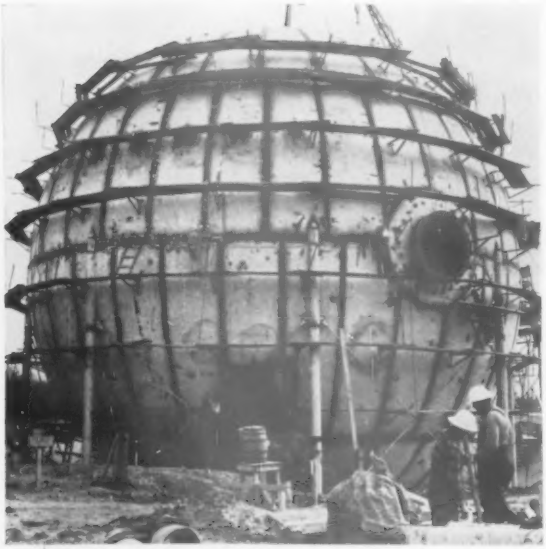
Design for welded plate fabrication

By Fred L. Plummer
Director of Engineering
Hammond Iron Works
Warren, Pa.



DESIGN standards for an oil tank with fixed roof require a joint efficiency of 85% for butt joints.

Any phase of the general problem of design could stand alone as a topic for lengthy discussion. Similarly, plate fabrication covers a wide range of products and materials. The author, therefore, has limited his discussion of welded design to two relatively simple, field-erected storage vessels: an oil tank and an unfired pressure vessel.



THIS spherical pressure vessel will withstand full vacuum or pressure up to 60 psi.

HUNDREDS of thousands of tons of steel are used yearly in construction of storage tanks for petroleum products. These are flat bottom, cylindrical tanks with fixed or floating roofs storing volatile liquids at ambient temperatures which may range from over 100 F to well below 0 F.

These liquids generally are not severely corrosive. For many years, ASTM A-283 Grade C steel or its equivalent was used almost exclusively for such tanks regardless of tank size and plate thicknesses.

More recently, with increasing demands for larger capacity vessels and following failure of two or more large tanks in foreign areas when subjected to hydrostatic tests, the use of steels made with more careful quality control and more extensive mill tests has increased.

Mild steels conforming to ASTM A-284, A-131, A-373 and other specifications may provide limits to carbon and manganese content, and require fully killed finishing and fine grain practice, thus producing steels with better welding characteristics and greater notch and impact strength, especially at low temperatures.

Currently, a relatively small tonnage of such steel is used to meet special requirements for shell plates $\frac{7}{8}$ in. thick and thicker. However, most users continue to ac-

This article is based on a paper presented before the Midwest Welding Conference in Chicago, Feb. 1-2, 1956.

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another Vickers FIRST for better welding

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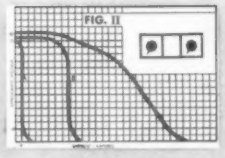
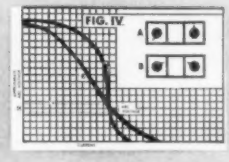


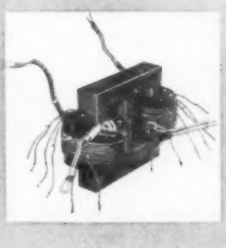
Maintains good arc stability through the complete current range from extremely low to extremely high without range switches.



Can bend the volt-ampere curve to meet the particular welding job being done.

Gives complete automatic arc control in any welding position.

Can strike an arc without the use of high frequency when using inert gas and tungsten at extremely low currents.



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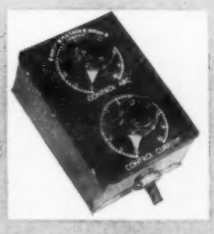

Exclusive dual remote control equipment available provides close control of complete current and voltage range.

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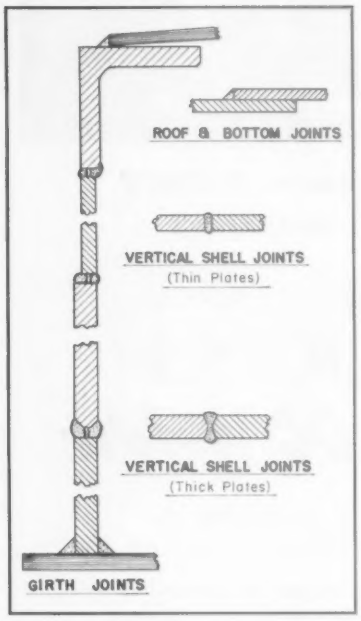


cept A-283 Grade C steel for use in all thicknesses up to 1½ in., which is the maximum thickness permitted by Standard 12-C for vessels of this type.

Stress analysis problems for such tanks with fixed roofs are quite simple and follow conventional methods. Shell plate thicknesses are computed for tanks full of water with allowable tension stress equal to 21,000 psi and joint efficiency of 85% for butt joints.

Roof Supports

Minimum thicknesses of 3/16 and ¼ in. are used for roof and bottom plates. Roof supports are designed as for other structures, the size of columns being determined usually by slenderness ratio rather than load because of their great unbraced length.

Tank bottoms (which generally rest on sand foundations) and roofs are made of rectangular plates with lap joints. They require no shop fabrication except for shearing or burning of sketch plates located at the shell of the tank and shaped to fit its curvature.

Shell plates must be "squared" and the edges prepared for welding by planing or burning. Both methods may be used advantageously. Some plants find that planing for thin cuts and burning for thicker cuts on the same plate may result in lower costs. Thin plates may also be sheared.

Design of wind girders used on open-top tanks offers a good example of how such design may be influenced by available fabrication equipment. These are circular girders with horizontal web, attached to the outside of tank shell near its top.

Welding Now Used

In older, riveted tanks they consisted of flanges made of angles and plates rolled or pressed to proper curvature and web plates cut or burned along two edges to corresponding curvatures.

The four or more separate elements were riveted together and to the tank shell. Many welded girders have been constructed in the same manner with welds replacing rivets.

However, if a suitable bending brake is available, the girder may be constructed of segments consisting of a single plate burned along one edge to fit tank shell curvature and with the straight edge formed to a channel section. Much of the fabrication cost will be eliminated.

Tank roof and bottom plates are usually joined with lap joints and full fillet welds on the topside only. For plate thickness of 3/16 in., commonly used for roofs, a 7/32-in. E6012 electrode is used; for ¼ in.-thick-plates, a ¼-in. E6012 will do the job.

These are downhand, one-pass welds which must be vapor- and liquid-tight but are not normally subjected to severe stress conditions. Automatic welding equipment has been used for making these welds. However, manual welding must still be used on areas where three plates lap.

E6012 Is Satisfactory

Use of completely manual welding with a fast E6012 electrode results in economical welds of satisfactory quality. In general, it is not practical to weld bottom plates from both sides. This can be done by assembling plates on supports and then lowering to grade. Resulting costs, however, are excessive.

If joints of greater strength or better corrosion resistance are required, butt joints beveled to a 30-deg included angle (with no land and a gap equal to thickness of plate for ¼ or 5/16-in.-thick plates) may be used with a backing strip.

A ¼-in.-diameter "hot rod" of the E6020 type is used for welding. If a backing strip cannot be used, an alternate design of a butt joint with a 60-deg included angle groove and ⅛-in. land and gap may be used.

The first pass is welded with a 5/32-in. E6010 electrode and the joint is then finished with a ¼-in. E6020.

Horizontal or girth seams between shell plates must be vapor- and liquid-tight and corrosion resistant, but are normally subjected only to low-value compression stresses.

Welding Procedure

Plate thicknesses less than ⅜ in. are butt welded with a gap varying from 3/32 to 5/32 in. The inside of the joint is welded first, the first pass is back-stepped, and all passes are made with 3/16-in. E6012 electrodes. No back chipping is required.

For plates ⅜ in. thick and more, the bottom plate has a square edge and the upper plate is double-beveled at 45 deg with a land equal to one-third the plate thickness and a gap of 5/32 in. Welding is completed in the same manner used for thinner plates.

Some users require horizontal joints having 100% penetration to provide more corrosion resistance. Thinner plates are welded as noted above, except that after welding is completed on the inside of the joint, the first bead must be back-chipped from the outside before completing the outside weld.

For plates ⅜-in. thick and thicker, the bottom plate has a square edge. The upper plate is double-beveled at 45 deg with a 5/32-in. gap. Land width, however, is made equal only to one-quarter the plate thickness to reduce difficulty of back-chipping.

For complete penetration of plates thicker than ¾ in., the bottom plate is also double-beveled at about 20 deg to make welding and back-chipping easier.

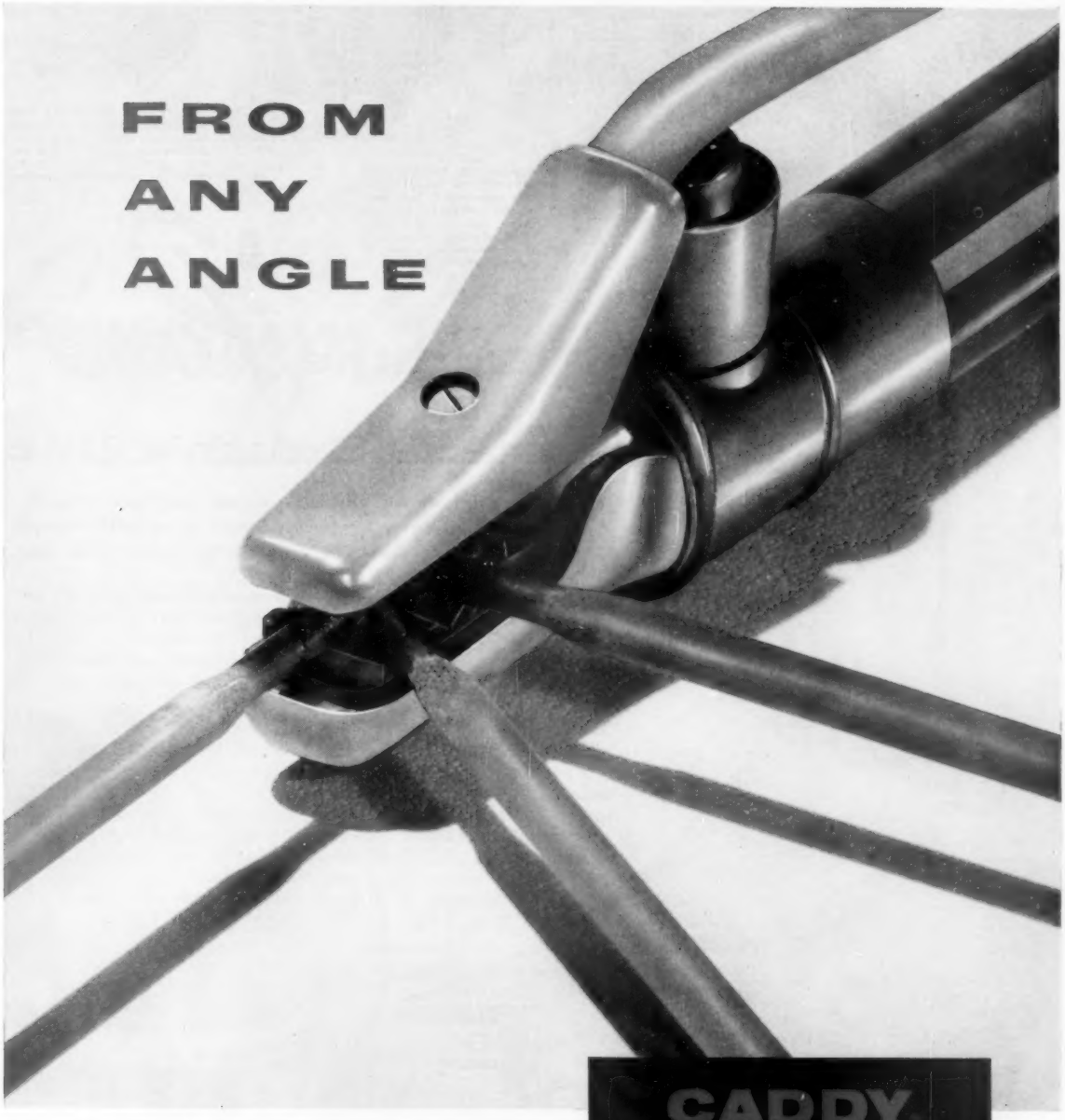
Weather Affects

All welding for field-assembled storage vessels more than 200 ft in diameter and 50 ft or more in height must be done in position under weather conditions as they exist at the tank site. Welding is not permitted when base metal temperature is less than 0 F.

If base metal temperature is in the range from 0 to 32 F, or if plate thickness is 1 to 1½ in., regardless of temperature, base metal within 3 in. of the point where welding starts should be heated to a hand temperature.

If plate thickness is greater than 1½ in. (thicknesses up to 2 in. are permitted for water storage tanks),

BEST



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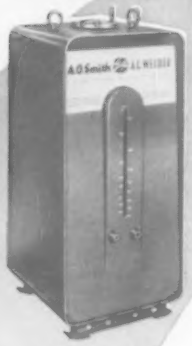

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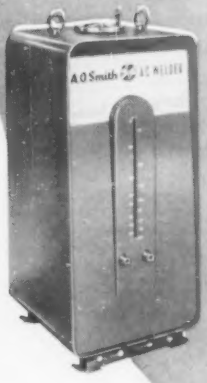

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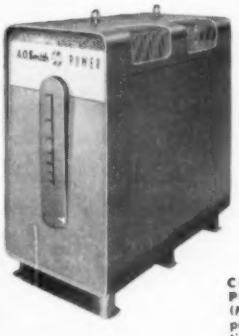

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base metal within a minimum distance equal to 4 times the thickness of the plate from the edges where welding is to start should be heated to a temperature of 200 F.

This temperature should be maintained over the same width as welding progresses. With these precautions, E6010 electrodes may be used throughout for vertical joints.

Low-Hydrogen Electrodes

Preheating and maintaining heat in the field is difficult and often involves excessive costs. Use of low-hydrogen electrodes for welding thick plates gives results comparable to 300 F preheat, if temperature of the steel is 60 F or higher.

If such electrodes are specified, consideration must be given to the following factors:

1—The cost of a low-hydrogen electrode will be higher than an E6010 and more time will be required to weld a vertical joint;

2—Penetration of low-hydrogen electrodes is less than that of E6010's and may require a change in joint preparation;

3—Slag is more difficult to remove for low-hydrogen electrodes as compared to E6010's;

4—The weldor may need special training (in use of a very short arc) in order to use the electrode properly, and

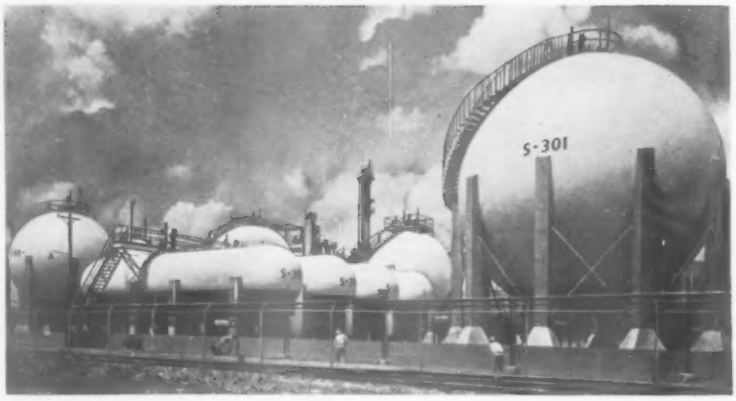
5—The electrodes must be kept dry, requiring an oven dryer at the job site.

High-Quality Welds

To secure welds of high quality, it is essential that back-chipping be done in a manner that reveals clean, sound metal, and that each weld bead be carefully cleaned of all slag. For welds with a face width of ½ in. or greater, successive beads except finish bead may be peened to reduce distortion and locked-in stresses.

To avoid serious distortions, it is essential that a carefully planned weld sequence be followed. The bottom plates are first placed in position and welded together in a specified sequence, working out from the center and leaving joints between center portion and sketch plates unwelded.

The first shell course is placed in position and vertical joints are welded. The T-joint between this shell course and bottom sketch plates is then welded, followed by completion of bottom joints.



WELDED fabrication of field-erected storage vessels presents many problems which proper design can overcome.

The next shell course is then assembled and vertical joints are welded before the girth seam between this course and the first course is welded.

This sequence is followed for remaining shell courses. Roof plates are welded in a manner similar to that for bottom plates.

Submerged-Arc Welds

Semi-automatic welding equipment of the "three-o'clock" type has been developed for welding shell girth seams. Two welding heads are mounted in frames and supported from a carriage which moves along the top edge of a shell course.

These are used to weld the girth seam at the bottom edge of the course from both sides simultaneously, with one arc leading the other by a few inches. Plate thicknesses of ½ to ⅝ in. can be welded in a single pass of the two heads at a speed of about 20 in. per minute, using ⅛-in. welding wire and a current of from 500 to 600 amp.

It seems probable that new developments in the use of inert gases for shielding may make possible the use of simpler equipment for such automatic welding.

Normal inspection of steel is required to insure use of specified thicknesses, free from defects such as laminations or inclusions. When the tank is completed, roof and bottom joints are tested with a vacuum box to insure vapor-and liquid-tightness.

The tank is filled with water to test shell joints for tightness and to insure working strength. In the past, weld quality has been given random checks by trepan samples. Recently the code has been changed to permit the use of spot X-rays as an alternate to trepan samples.

Pressure Vessel Design

For field-erected pressure vessels, ASTM A-285 Grade C steel of firebox quality has been most generally used. During recent years, a considerable tonnage of ASTM A-201 Grade B steel has been used for pressure vessels.

Very recently, the use of quenched and tempered high-strength steels has been extensively investigated and such use is now permitted in accordance with Case 1204 of the ASME Unfired Pressure Vessel Code. ASTM A-212 steel has been used for field-erected pressure vessels but is not generally favored because of welding difficulties.

Membrane stresses in pressure vessels due to internal or external pressures can be easily computed. Shell plate thicknesses for steels commonly used are based on allowable tension stress equal to one-fourth the ultimate strength of the steel used and joint efficiency of 80% for butt joints.

This is increased to 90% if joints are fully X-rayed and to 95% if, in addition, the vessel is stress relieved, a procedure which cannot usually be done economically for field-erected vessels *(see* "Giant unit becomes a furnace in the sky," WELDING ENGINEER, *Mar., 1956, p. 42)*.

Problem Areas

Difficult analysis problems arise in determining stresses in dished heads; at discontinuities where shell and heads intersect; around reinforced openings, and at support attachments.

All joints in pressure vessels must

The sturdy Taylor Velocipede frame of 2-inch mild steel tubing is braze-welded on this fixture, with ⅛-inch Anaconda-997 (Low Fuming) Bronze Welding Rod, using the oxyacetylene flame-fluxing process.

"...quickest, most dependable, most economical..."

"Braze Welding with Anaconda 997 (Low Fuming) Bronze Welding Rod is the most practical method of joining steel tubing," The Frank F. Taylor Co.

The strategically placed braze welds on Taylor Velocipedes have smooth contours, a good basis for a fine finish —and high strength to stand up in the hardest service. The Frank F. Taylor Co. also makes the famous Taylor-Tot, standard equipment in most young families.

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Anaconda 997 (Low Fuming) Bronze is a superior braze-welding rod widely used for the joining of steel, cast iron, and copper alloys by the oxyacetylene process. It is also used to deposit bearing surfaces on steel and iron. Anaconda Welding Rods are sold by distributors of welding equipment everywhere, such as O.K.I. Welding Company, Cincinnati, Ohio, which supplies The Frank F. Taylor Company.

See your Anaconda distributor for help in selecting the exact rod for your job. Or write for Publication B-13. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Company Ltd., New Toronto, Ont.

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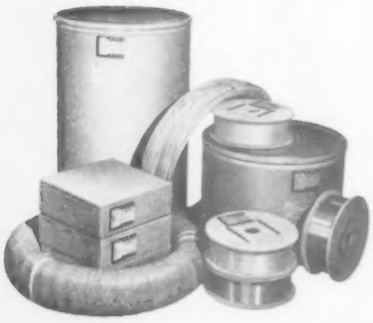

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generally transmit primary tension stresses and must therefore be complete-penetration butt welds of full strength. These joints are usually double-bevel grooves with a land of 1/16 in., a gap of 5/32 in. for plates thinner than 3/4 in. and of 3/16 in. for the thicker plates. The included angle is 45 deg if the land is located at the center of the plate.

Since these welds must be made in all positions for a vessel such as a sphere, it is more economical to offset the land or lip to a line one-third of the plate thickness from one surface of the plate. This produces a smaller groove on that side with an included angle of 70 deg and a larger groove on the other side with an included angle of 50 deg.

The larger groove is used on the inside of the sphere for the bottom half, and on the outside of the sphere for the upper half, thus making it easier and more economical to weld and back-chip. For flat welds, E6020 electrodes are used, and for all others, an E6010.

Overhead Procedure

For flat and overhead positions, weld beads are deposited in the large groove first, using 3/16-in. electrodes for the first pass and 7/32-in. electrodes for subsequent passes. After thorough back-chipping, overhead passes are deposited in the small groove with 5/32-in. electrodes.

On horizontal joints, weld beads are deposited in the large groove first, using 3/16-in. electrodes, and the joint is then completed with 5/32-in. electrodes. For vertical joints, weld beads in the large groove are deposited first, traveling up and using a 3/16-in. electrode.

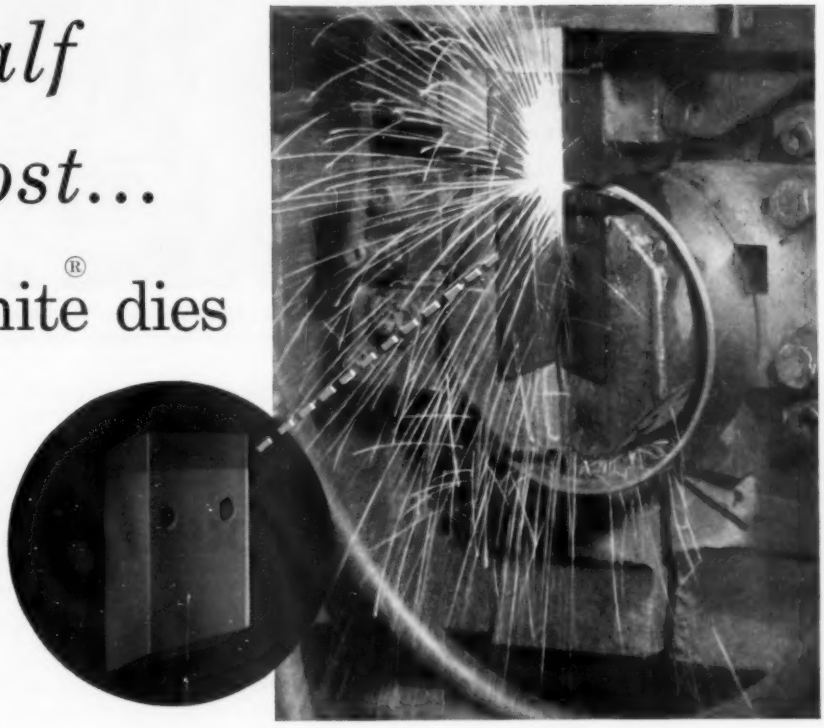
For the small groove, 5/32-in. electrodes are used and all passes are deposited traveling up except the last. Recommended amperages may vary from as low as 110 to a maximum of 250 for various conditions.

Spheres usually are supported on tubular columns attached to the sphere shell at the equator. The complete sphere is preferably assembled and fitted before any joints are completely welded.

In any case, at least three plate courses should be assembled before vertical joints in the middle course are welded. The girth or horizontal seam between two courses should not be welded until vertical joints for both courses have been welded.

4 *times more welds ...at half the cost...*

with Elkonite® dies



Die insert for this flash and butt welding machine is faced with Elkonite 10W53 . . . a dense, hard material with high resistance to arc erosion, high strength and good electrical conductivity. The backing material is Mallory 53 alloy.

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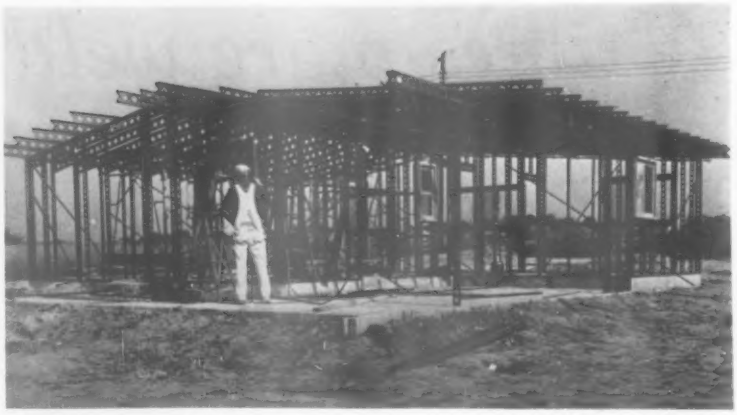
The eager response which has greeted every article on welded houses in WELDING ENGINEER* leaves little doubt as to the wide interest in this topic. Here's another—we hope it answers *your* home-building questions.



THIS East St. Louis, Ill., home-owner can credit welding for cheaper building costs and lightweight steel for strength and easy maintenance.

Do it yourself— weld a house!

By HARRY J. MILLER

WHEN a man builds his own house, much of his heart goes into it—as well as time and money. It's a pretty wonderful thing, once those dreams and hopes have been fashioned into solid reality, for any man to be able to say without qualification: "This is one home that will last!"

And it will, if he uses the newest types of lightweight structural steel developed to supplant conventional wood framing and such members as joists, studding, rafters, plates and sills.

Fabricated by welding, the new steel provides admitted superiority over wood and, in many cases, even costs less.

Through welding, for the first time in small home construction, cumbersome steel frameworks have been lightened. The average handyman can handle steel sections on the job site as easily as he now cuts and fits unseasoned and unpredictable lumber.

The steel work is actually easier because new structural steel sections, intended for custom design and construction, are far simpler to erect than wood studs or masonry blocks.

With some lessons in welding techniques under his belt, there is no reason why the man who wants to build his own home can't build a better one with lightweight steel.

Following instructions given in today's wealth of "how-to" books, the home mechanic needn't fear the result of his efforts with new materials and new techniques.

Openwork Cuts Weight

The new steel sections are lighter in weight because they are criss-crossed with open webbing cut in a double trussed pattern. This openwork fabrication also provides both economy and strength.

Since the webs are open, the passage of wiring and piping through erected studding and joists is obviously simplified. Open webbing also permits quick fastening of wires or clips for tying metal lath, gypsum lath or other surfacing materials. It is unnecessary to drill studs and joists on the job.

Lightweight welded steel structures are suitable for single and multiple residences, schools, and industrial and commercial structures. Formed into a complete range of lengths, depths and shapes, they offer the lone house builder a variety that will fit almost every conceivable house design.

Fabricated from steel by cold rolling, new structural designs differ radically from the hot-rolled structurals which are a familiar sight to sidewalk superintendents. Many of these onlookers have probably relished the thought of using steel, with its many obvious advantages, for home construction.

Steel is stronger than wood and far safer. It does not warp, shrink or split. It is not subject to rot, and in termite-ridden areas it represents substantial economies in inspection and

A BEAUTIFUL home that will outlast any comparable wooden structure is this ranch-style house in Dallas, Tex. Fireproof, rotproof steel was fabricated entirely by welding.

**In 1955 alone, four such stories were published; they appeared in the February, June, September and November issues. Articles in the August and October issues of 1954 also deal with welded houses.*

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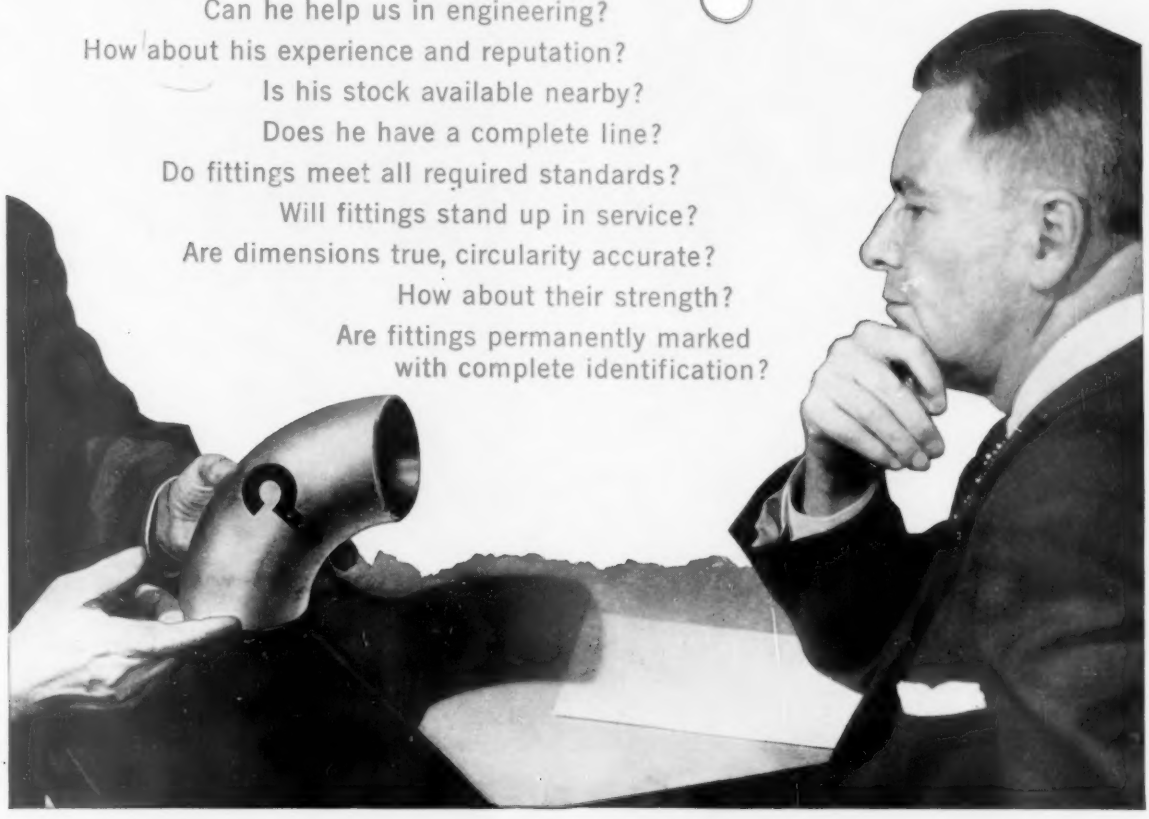

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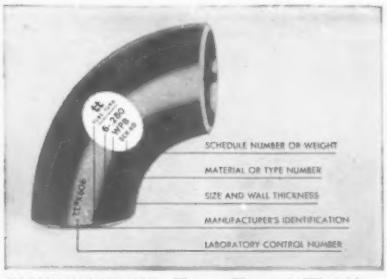

CLEARLY MARKED. TUBE-TURN* Welding Fittings are completely identified as to dimensional and metallurgical facts. Here is your assurance that you have the RIGHT fitting, and that it has passed Tube Turns' rigid inspection and quality control.

This is just *one* reason why you should specify the leading brand of fittings and buy from your trusted Tube Turns' Distributor.

TUBE-TURN Welding Fittings and Flanges are made in U. S. A.
They meet *all* U. S. piping code specifications.

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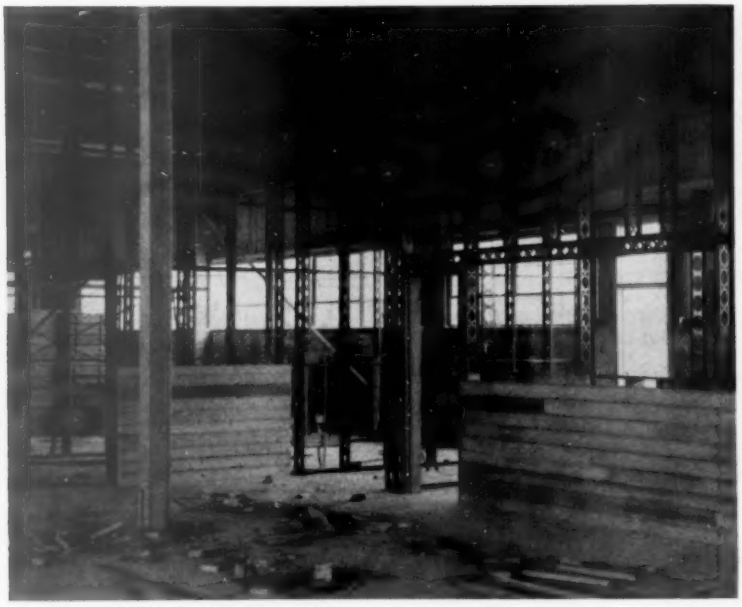

SMALL industrial construction or expansion can be economically handled by welding lightweight steel framework.

extermination costs.

But, until now, the weight and cost of steel sections have excluded them from consideration by the individual builder.

The factor that sparked the use of lightweight structural steel shapes by small builders, and that brought steel within their budgets, was the forming of sections by rolling rather than pressing.

Economy in Forming

Strip steel is formed into strong studs and joists on a line of high-speed cold rolling and punching machines. Since it is unnecessary to work and rework each section under multiple-pass rolls, production costs have dipped to the point where steel can compete with wood.

Like the familiar pattern of sky-scraper skeletons, each piece bears a factory-applied coat of red zinc chromate paint that guards it against rust. Builders can erect a steel frame for any small building from the varied sections available.

A crane is never needed to erect the 3¼, 3⅝, 4, 6 and 8-in.-deep sections which are precut to order in lengths up to 28 ft. Studs and joists come in single and double form, with the single stud or joist in a channel form. The double stud or joist resembles an I-beam in cross section and is made by welding two single units back to back.

Almost any degree of strength can be attained. For example, a stud capable of withstanding super stresses is built by slipping a length of bridging inside the flanges on each side of a double stud.

Three in One

This combination is then boxed by placing two lengths of light structural track around the stud. The result is a column having the compressive strength of three double studs, yet occupying the space of only one!

When the do-it-yourself mechanic attaches collateral wall and ceiling materials, he need only drive nails into a grooved space in a joist or double stud. The nails are held fast by friction, and deformed to provide maximum holding power.

It is true that builders, architects and buyers in the light construction field have seldom specified steel frames for their creations. This is understandable in view of the high cost of hot-rolled sections and the manpower needed to handle them.

But, since the handyman with a house-building gleam in his eye can now handle and weld the new steel himself, it's apparent he is due for a new deal.

This is certainly true in those areas where a 3¼-in. *steel* stud is lower in cost than a termite-beckoning, wood two-by-four! And easier still to install.

SHIELDALLOY

materials for the WELDING ROD manufacturer

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- FERRO COLUMBIUM-TANTALUM
- FERRO MANGANESE (LOW, MEDIUM AND HIGH CARBON GRADES)
- FERRO TITANIUM (LOW CARBON 30% AND 40% Ti GRADES)
- FERRO TUNGSTEN
- FERRO VANADIUM
- TUNGSTEN "MELTING BASE ALLOY"
- TITANIUM ALUMINUM

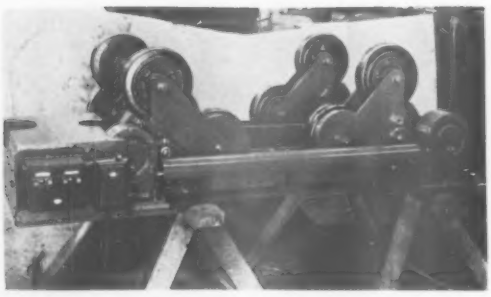
PROCESSED MINERALS and ORES

- CHROMITE
- "AGF" FLUORSPAR (COARSE AND FINELY GROUND GRADES)
- HAUSMANNITE (MANGANESE OXIDE)
- ILMENITE
- IRON CARBONATE
- IRON OXIDE (HEMATITE AND MAGNETITE ORES)
- KAOLIN CLAY
- "SM" MICA
- RUTILE "96" (MILLED AND GRANULAR)
- ZIRCON — ZIRCONIUM SILICATE (MILLED AND GRANULAR)

SHIELDALLOY CORPORATION

West Boulevard
Newfield, New Jersey

Write For Free Materials Specification Booklet



THIS self-aligning power roll handles cylinders 4½ in. to 6 ft in diameter, has maximum load capacity of 2 tons.

Power rolls are self-aligning

By John Grindrod

FOR POSITIONING tubular structures to provide maximum welding convenience, new self-aligning power rolls, which require no adjustment for a wide range of diameters, have recently been developed by F. Bode & Son, Ltd., of Leek, Staffordshire, England.

Capable of handling loads up to 20 tons, the largest of these time saving pieces of equipment can accommodate vessels from 2 to 12 ft in diameter. Each roller unit normally consists of one driving and one idler section, though additional idler sections can be used if required.

Roller brackets on both power and idler sections each carry a pair of roller axles at fixed centers relative to each other, and pivot around trunnion shafts which are also at fixed centers on the frame.

No Pre-adjustment

This patented arrangement permits instant alignment of roller brackets to workpiece on loading, without pre-adjustment and irrespective of ovality or irregularities in the periphery of the workpiece.

Whatever the diameter, the workpiece remains central to the frames, enabling welding units and auxiliary equipment to be conveniently positioned without frequent adjustments. On unloading the workpiece from the rotator, the easy pivot action of the roller brackets operates in reverse, allowing a slow return to their resting position to receive the next item.

Being unbalanced, roller brackets incline inwards by their own weight, but steady raising of the workpiece insures a gradual return to rest, even if the fastest crane available is used for unloading.

Driving the powered roll section is an electric motor running at 1,650 rpm. This speed is reduced to 275 rpm by a 4-in. worm gear unit with a 6-to-1 ratio, and further reduction is incorporated to achieve a surface movement of 3 to 17 in. per minute.

Overload Protection

The gear unit is protected from overload by a plate wheel friction adapter chain drive between the output shaft and the input to the primary single-worm reduction gear unit.

Secondary single-worm reduction gear units are mounted on each trunnion center. Connected by a cross-shaft and flexible couplings, they are driven through a flexible coupling from the primary reducer. The final drive is transmitted to the roller axles from the trunnion centers by means of common roller-chain drives.

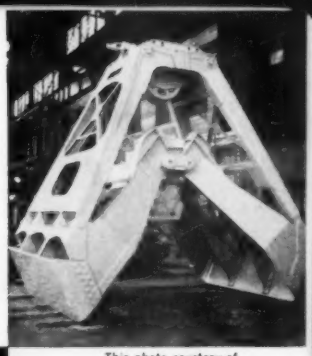
Constant surface speeds of between 3 and 17 ipm, or other ranges as required, are selected by means of a handwheel control on the variable-speed gearbox. Outer roller axles are fitted with a double friction-plate clutch which is disengaged by means of a handnut. This allows rollers to rotate independently under the action of the lowered load, which aligns pivot brackets.

For smaller workpieces, Bode has developed a model upon which cylinders from 4½ in. to 6 ft in diameter can be rotated at variable speeds.

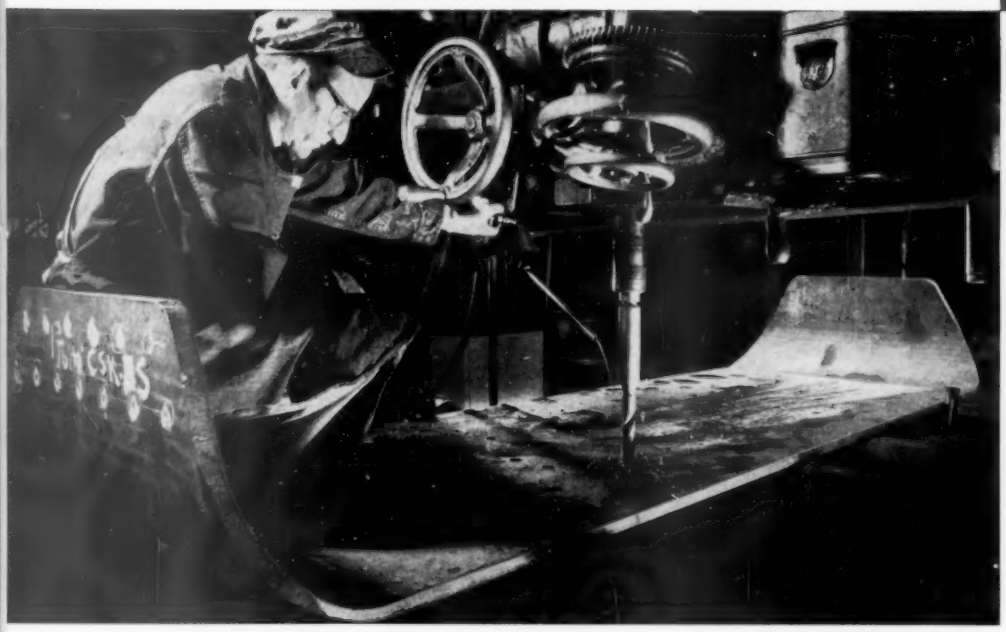
In ore clean-up buckets

FABRICATION SIMPLIFIED WITH USS "T-1" STEEL

(and weight reduced more than ½ ton)



This photo courtesy of Blaw-Knox Company.



HALF AS THICK! In the trays for giant ore clean-up buckets, 1¼" USS "T-1" Steel Plate, with a yield strength of 90,000 psi., replaces cast trays which were as much as 2½" thick. The new buckets —lighter in weight by more than half a ton — and expected to outperform the heavy cast trays, will be used at United States Steel's South Works.

UNITED STATES STEEL CORPORATION, PITTSBURGH
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION,
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

• The trays of ore clean-up buckets must have phenomenal shock and abrasion resistance to hold up under constant scraping and scouring along the steel bottoms of ore boats. They are commonly made of heavy steel castings. But recently, Blaw-Knox Company, Pittsburgh, Pa., *fabricated* trays for several new buckets from USS "T-1" Steel Plate. This amazing new alloy steel assures the needed strength and durability, plus important fabricating advantages.

LESS WEIGHT — LESS EXPENSE

Biggest single advantage of fabricating from "T-1" Steel Plate is less weight. New trays weigh only 4,021 pounds each, compared to 5,068 pounds for comparable cast manganese steel trays. Thus, "T-1" decreases the weight of the bucket and reduces shipping and handling costs.

What's more, fabrication from "T-1" simplified the building of these huge buckets. It eliminated the expensive patterns needed for cast trays. Because "T-1" has tremendous resistance to impact abuse and abrasion, it is expected that it will outperform previously used materials.

For these ore buckets, "T-1" Steel is flame-cut to size, *cold formed* in a 1,250-ton press, drilled and then riveted to the bucket shell. "T-1" also can be welded—without pre- or post-heating. Because of its unusual combination of properties, it is cutting costs in many rugged applications.

LOOK AROUND YOUR SHOP

In your own equipment, or in the products you make for others—wherever you would like to increase service life . . . wherever you would like to reduce fabricating costs of heavy-duty parts—look into the possibility of using "T-1" Steel. Competent technical advice is always available, of course — free of charge — from United States Steel. Write, wire, or phone for complete information. United States Steel, Room 5218, Pittsburgh 30, Pa.

USS "T-1" CONSTRUCTIONAL ALLOY STEEL

USS

UNITED STATES STEEL

A Report on Automatic Arc Welding

A G-E WELDING ENGINEER EXPLAINS ARE TURNING MORE AND MORE TO

Roger W. Tuthill, Welding Process Engineer for the General Electric Company's Welding Department, answers some of the more frequently asked questions about the gas-shielded, consumable-electrode welding process.

Mr. Tuthill's answers explain the increased attention this process is receiving from production and welding people as automation begins to make greater demands on production welding.

Mr. Tuthill has been active in research and development on Fillerarc welding, General Electric's gas-shielded process, and has had a number of papers published on the subject.

Q. What is the gas-shielded welding process?

A. Gas-shielded welding is a consumable-electrode arc welding process which uses a reel of bare electrode wire fed mechanically through a welding head. Gas, such as carbon dioxide or argon, flows around the electrode to form a protective shield about the arc.

Q. Is there anything particularly new about gas-shielded arc welding?

A. Yes—if you're talking about *automatic* gas-shielded arc welding!

Historically, powdered flux has been used as the shielding agent in automatic arc welding, mainly because no gas process was economically feasible for welding mild steel. However, gas-shielding was attractive to many prospective users because it eliminated the many problems created by the use of flux—expensive flux recovery systems, flux inclusions in welds, flux in the air, more precise fixture requirements, and other difficulties.

Gas-shielding has been used for welding non-ferrous and stainless steels, but the relatively high costs of the inert gases used made gas-shielding impractical for mild steels.

Recently, the successful application of low-cost carbon dioxide as a shielding gas has finally made it economical to use gas-shielded equipment for welding mild steels. For example gas savings of 90% over inert gas costs have been reported. Since by far the most welding being done today is on mild steel, it is easy to see why this development is causing so many production people to turn to automatic gas-shielded arc-welding for answers to their production welding problems.

Q. Does a gas-shielded automatic welding system cost any more than other automatic arc welding systems?

A. The cost of setting up a gas-shielded system is about the same as for a comparable submerged-arc automatic system.

For example, while the *purchase* price of gas-shielded automatic equipment may be more than that of a submerged-arc system, the fact that there is no need for installing expensive flux recovery equipment and other cleaning systems with gas-shielded welding easily makes up the purchase price difference.

Q. Does the quality of welding done with gas-shielding compare with other welding processes?

A. Quality of welds made with the gas-shielded automatic welding process compares very favorably with other processes. Since no flux is used there is no possibility of flux inclusions; penetration is usually deeper; and the visible arc permits full control during welding. This visible arc permits less expensive fixtures to be used, an important cost factor in automatic welding.

Q. How about the speed and flexibility of a gas-shielded system? Can it be easily integrated into a production line?

A. A gas-shielded system can be used in production line welding as easily as any automatic welding system.

For example, the G-E Fillerarc system has electrode wire feed speeds which range up to 1000 inches per minute.

WHY FABRICATORS OF MILD STEEL AUTOMATIC GAS-SHIELDED WELDING

The automatic head can be rotated through 360 degrees and can be used for circular or seam welds, and, if necessary, more than one welding head can be used to make multiple welds.

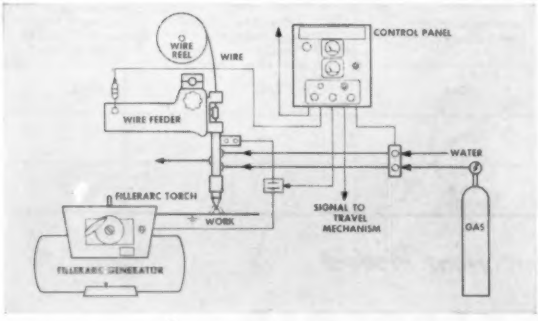
These characteristics make the Fillerarc system flexible and fast enough for almost any production line. Perhaps of equal importance to production people is the system's insensitivity to incoming line voltage, which assures constant production speed and weld quality.

Q. To sum up, what are the really important advantages of the automatic gas-shielded welding process?

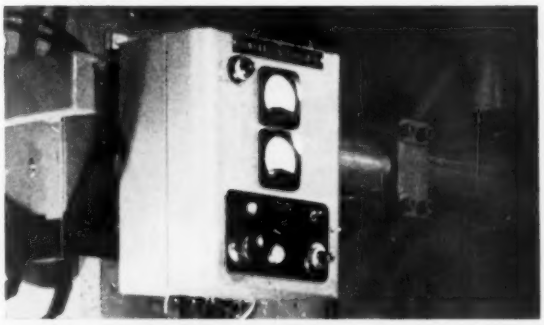
A. In a few words, the most important advantages of the automatic gas-shielded process are flexibility, high welding speeds, uniform weld quality, elimination of the cleaning problems associated with the use of flux, versatility for use with all types of metals, and most important of all, the ability to use low-cost carbon dioxide for shielding.

For more information about Fillerarc automatic gas-shielded welding see your nearby G-E Welding Distributor, or write for Bulletin GEC-1334, Section 713-4, General Electric Company, Schenectady, N. Y.

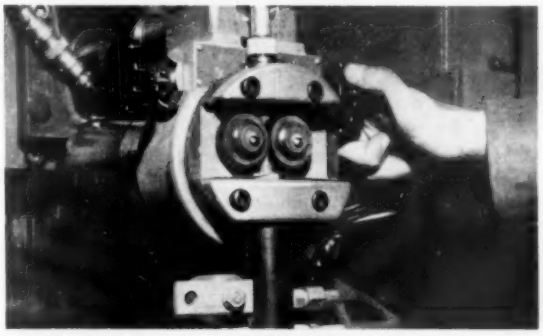
See G-E Fillerarc automatic welding equipment demonstrated at the American Welding Society Convention, Buffalo, N. Y., May 9–11. Booth numbers 47, 48, 49.



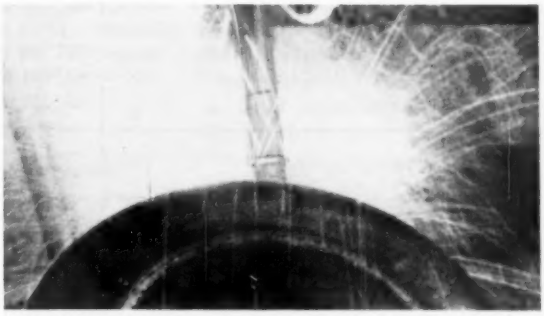
G-E FILLERARC EQUIPMENT is the only complete equipment especially designed for consumable-electrode, gas-shielded welding. Simplicity of the system makes possible use of less expensive fixtures and greater over-all efficiency.



WIDE RANGE OF WIRE-FEED SPEEDS—up to 1000 inches per minute—makes the G-E Fillerarc system flexible enough for any production line. Speed is constant since system is insensitive to normal line-voltage changes.



FLEXIBILITY OF FILLERARC SYSTEM is also demonstrated by the automatic head. It rotates 360 degrees, allowing even overhead welding. Arc is completely visible since gas is used as the shield instead of flux.

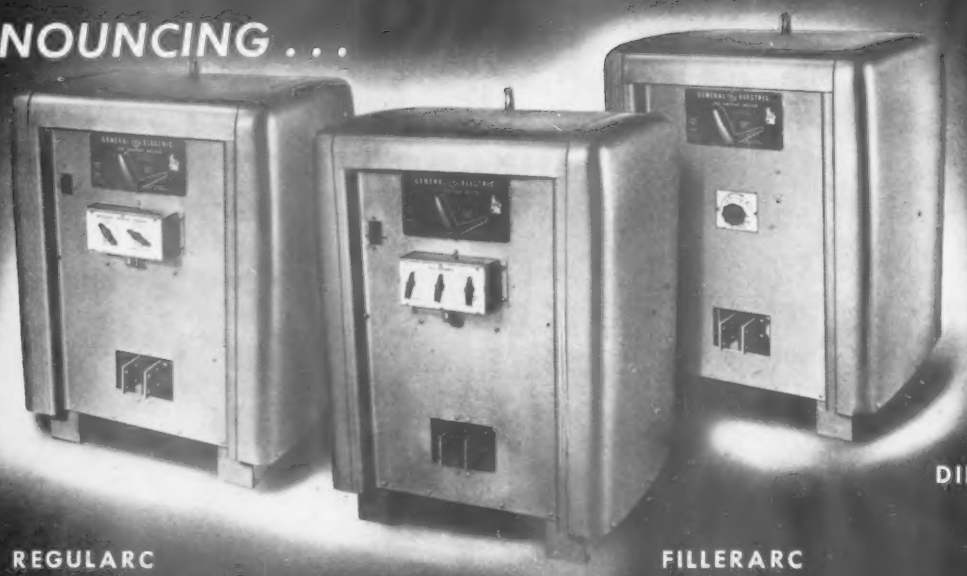


CIRCULAR OR SEAM WELDS may be made on stainless steel, copper, aluminum, and other metals—using inert gas. Fillerarc power sources, rectifier or motor-generator, and carbon dioxide combine for low-cost, quality welds on mild steel.

Progress Is Our Most Important Product

GENERAL ELECTRIC

ANNOUNCING . . .



REGULARC FILLERARC DIRECTARC

3 NEW G-E Power Sources for Automatic Welding

Now, three new General Electric 800-amp rectifier welders join the already-proved Fillerarc 450-amp motor-generator set as power sources for the expanding gas-shielded automatic welding process.

The three new power sources are designated FILLERARC, REGULARC, and DIRECTARC and offer a complete choice of output characteristics and automatic features. (See comparison chart below.)

FILLERARC—gives you the ideal power source for automatic gas-shielded welding. Like the 450-amp Fillerarc motor-generator, this rectifier welder has a unique rising volt-ampere characteristic which automatically matches the arc requirements for all electrode wire feed speeds. It is immune to changes in incoming line voltage, thus assuring consistent weld quality.

REGULARC—The first *true* constant-potential power source offered for automatic welding, this welder provides all the features of the Fillerarc model except that it has a flat volt-ampere characteristic. This is the set for you if your application requires regulation of incoming line voltage and only relatively small changes in electrode wire feed speeds.

DIRECTARC—With minimum investment, Directarc offers the same high quality design and construction of the other models without the automatic features. Directarc is the choice for you if you have a well-regulated incoming line voltage and your application requires only one arc length and electrode wire-feed speed.

QUALITY RECTIFIER FEATURES — All three models offer the same high quality you've come to expect in G-E rectifier welders—quiet operation, combination cleaning-cooling fan, easily removable side covers, and Class H silicone insulation.

For more information see your nearby G-E Welding Distributor (He's listed in the yellow pages of your phone book) or write Section 713-5, General Electric Company, Schenectady 5, N. Y.

Power Source	Output Volt-ampere curve	Immune to Incoming Line Voltage Change	Adjustable Starting Voltage	No Change in Arc Length with Change in Electrode Wire Feed Speed
FILLERARC	Rising	Yes	Yes	Yes
REGULARC	Flat	Yes	Yes	No
DIRECTARC	Essentially Flat	No	No	No

Progress Is Our Most Important Product

GENERAL ELECTRIC

WELDING VARIABLES

WELDING RUN	ELECTRODE FORCE (POUNDS)	PERCENT HEAT	WELDING CURRENT (CYCLES)	SQUEEZE TIME (CYCLES)	HOLD TIME (CYCLES)	ELECTRODE GEOMETRY
A	4000	100	16 - 60	80	60	5/8"
B	4000	100	8 - 48	80	60	
C	1300	100	6 - 50	80	60	5/16" 5/8" 20°

MACHINE settings used for spot welds later tested to failure.

Spot welds under stress

By: **Lt. John F. Rudy, U.S.A.F.**
Professor R. B. McCauley
Professor R. S. Green*

SPOT WELDING specifications of quality are probably expressed more often in terms of tension shear strength than all other parameters combined.

The purpose of this study was to indicate a relationship between weld strength and three other parameters: system of failure, macrogeometry of weld cross-section, and observations of a cut-away weld cross-section under stress.

These correlations will increase the value of each as a measure of spot weld quality.

Experimental Procedure

In a sense, this investigation is a study of changes in weld properties which occur with a change in weld cross-section geometry. Therefore, welding machine settings were chosen to produce a variety of weld cross-section shapes.

Three welding runs were used. All machine variables were held constant except for duration of current flow. The time in cycles was varied in small increments, and either electrode shape or welding force was changed from run to run.

Welding was done on a two-phase, 60-cycle, 150-kva spot welder. Current durations greater than the 30-cycle, single-pulse maximum were obtained in two pulses separated by one cycle of cool time.

Prior to welding, inside and outside surfaces of the specimen were cleaned with a wire brush and a fine emery cloth. Four to six tension-shear coupons (single-spot) and two specimens for metallographic examination were prepared at each machine setting combination at the same time.

Sectioned Spot Shear Test

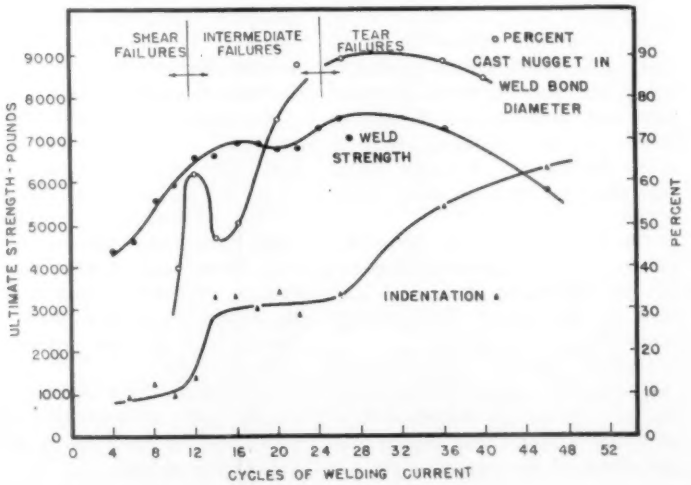
When employing the sectioned spot shear test technique, a spot weld is sectioned, polished and etched. The grain structure thus exposed is observed as the weld is loaded in tension shear.

In this manner, microscopic evidences of plastic strain can be traced from grain to grain as the joint is subjected to increasing levels of stress.

In the fabrication sequence, 2 by 4 by 11-gage (0.125-in.) sheets are spot welded in two places. The first spot is the test weld, identical to the whole welds with which it is compared.

A center section of this test weld was exposed by a saw cut running the entire 6-in. coupon length. The exposed section was then polished

This article is based on a paper presented by the authors at a meeting of the American Welding Society. Lt. Rudy is project officer at Wright Air Development Center; Professor McCauley is chairman of the department of welding engineering, and Professor Green is executive director of the engineering experiment station, at Ohio State University.


SHEAR FAILURES
INTERMEDIATE FAILURES
TEAR FAILURES
o PERCENT CAST NUGGET IN WELD BOND DIAMETER
• WELD STRENGTH
INDENTATION
ULTIMATE STRENGTH - POUNDS
PERCENT
CYCLES OF WELDING CURRENT
0 1000 2000 3000 4000 5000 6000 7000 8000 9000
0 10 20 30 40 50 60 70 80 90
0 4 8 12 16 20 24 28 32 36 40 44 48 52

LEFT: Chart shows results of welding run "C" (above), and indicates parameters vs. weld heat.

and etched to reveal the weld microstructure.

Balancing Eccentricity

Purpose of the second weld was to balance eccentricity of the tensile machine loading and thus limit stresses in the test weld to those due to tension shear. The second weld is also weakened by a saw cut so that both half-welds will be approximately the same strength.

If the test weld is to be observed at stresses up to weld failure, it must fracture before the second weld. The tension shear system of loading is destroyed as soon as either spot fails.

After the specimen was prepared, polished and etched, the cross-section was observed at no-load, and three fine, vertical lines were scribed on the polished surface. These lines traced subsequent deformation and located cross-section areas under observation.

The specimen is then loaded to a low stress level, removed from the tensile machine, examined under a microscope, reloaded to a higher stress level and re-observed until failure occurs.

Physical Test Results

Physical testing performed as part of this program gave, first, ultimate strength of each weld set in tension shear and, second, a characteristic system of failure for each weld.

Attempts to obtain a measure of joint ductility with the cross-tension test were abandoned because of the insensitivity of material to the circumferential notch.

Ultimate strength of each weld group was taken as the average of four to six coupons pulled to failure in the tension shear test. The coupons used were the RWMA-recommended standard for 11-gage material. A hydraulic tensile testing machine was used with a loading speed of 0.2 in. per minute. No yield point was observed.

Characteristic system of failure was recorded for each test. These systems are shear, intermediate and tear. All failures, with natural variations, fit into one of these three categories.

Geometry of Cross Sections

One of the four parameters studied was the geometry of weld cross-section. Sizes and shapes of zones in each cross-section weld set were determined. Actual measurements recorded were weld bond diameter, cast nugget diameter, cast nugget height and weld thickness.

A single joint from each weld setting was sectioned, polished, etched and microscopically observed. Dimensions were then determined with a micrometer eyepiece mounted on a metallograph.

In instances where shapes and sizes seemed out of line with adjacent welds, dimensions were checked by preparing a second specimen that had been welded at the same time.

Accuracy of these measurements is dependent primarily on the technician's ability to expose a section of the weld which is a diametrical plane.

Shear System of Failure

In a typical shear failure of a spot weld loaded in tension shear, the irregular surface in the center of the fracture circle shows that some base metal deformation did occur. This is in contrast to a weaker group of shear failures in which the fracture circle was a smooth plane.

The weld bond in both cases was a solid-phase, heat-and-pressure type. In the first case, however, this bond is strong enough to withstand the applied load, and the path of fracture is in the parent metal.

In the weaker case, the solid-phase bond in the faying plane is not completely formed and fracture occurs along the plane of bonding.

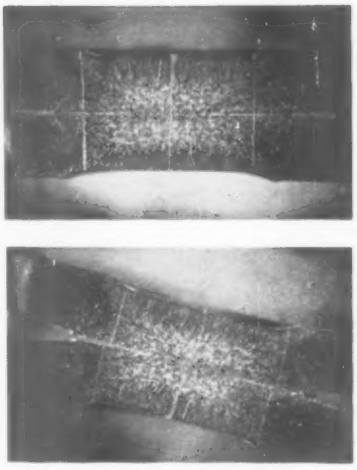
Intermediate Failure

Some spot welds which fracture within the intermediate classification exhibit a large planar area in relation to the area of the pulled button. These intermediate-type failures are said to resemble shear, while opposite extremes resemble the tear-type system of failure.

A typical tear failure shows no part of the fracture path parallel to the faying plane. Failures observed were tears either around the spot or across one of the sheets. In both cases, the fracture is tensile rather than shear or slip as in other failure systems.

The fracture is almost perpendicular to the direction of loading and has the appearance of a tensile fracture in the welded sheet slightly removed from the nugget.

Scribed lines are bent on either end of the cast nugget, but the center line is only slightly deformed, if at all. This suggests that defects in the center of the nugget might not be too important in this instance.



ABOVE: An unstressed, solid-phase, bond spot weld has three scribed lines to show effects of stress loading. Bottom: Lines are displaced after application of maximum load, showing weld failure in shear slippage along faying plane.

The shear, intermediate and tear failure systems were separate and distinct from each other according to observed behavior of weld sections under stress. It is to be expected that such marked differences in strain behavior will be reflected in ultimate strength of the weld in tension shear.

The initial strain reaction to stress is the same in each system; that is, evidence of strain first appears at the weld edge and progresses along the faying plane toward the center of the weld.

Blocked Movement

The difference between the three systems is the manner in which this movement along the faying plane is blocked. In the shear system of failure, this movement is allowed to continue through the spot.

The intermediate system of failure produced a change in the slippage path after considerable progression along the faying plane. Failure by tearing resulted from almost immediate interference with faying plane slip. Reasoning that strength increases with interference to strain, the order of strength should be shear, intermediate and tear systems, from weak to strong.

Development of a cast nugget obviously plays an important part in distribution of stress and in the spot weld failure system.

SET 'EM and FORGET 'EM

Two-stage
PUROX
Trade-Mark
REGULATORS

SPECIFICATIONS

Type	R-201	R-202	R-203
Use	General welding and medium-heavy cutting	Heavy-duty cutting	All welding and cutting
Gas	Oxygen	Oxygen	Acetylene
Maximum Delivery Pressure	75 lb. per sq. in.	200 lb. per sq. in.	15 lb. per sq. in.
LIST PRICE	$39	$39	$37

Here at last are regulators so accurate in operation, so safe and dependable, that you'll quickly forget you have them on your cylinders. Set them just once. You'll never have to readjust them while work is under way. It makes no difference whether cylinders are full, half full, or nearly empty. The precise flame you get, without fluctuation, guarantees faster, easier, and more uniform results every time.

This superior performance comes from large-diameter diaphragms and good engineering design. There are no delicate mechanisms to require constant care and adjustment. So you get a built-in durability that cuts maintenance costs to the bone. Easy-to-read gauge dials, pressure-forged bodies and caps, porous metal inlet filters—these are a few additional features that make it worth your while to get all of the facts about PUROX Two-Stage Regulators today.

see your
LINDE JOBBER
Today

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Linde Air Products Company,

a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. In Canada: Linde Air Products Company, Division of Union Carbide Canada Limited, Toronto.

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. . . AT THE

Look for this sign of Progress in Welding

MUREX® electrodes for
mild steel • low alloy steel • stainless steel
hard surfacing • aluminum • cast iron
aluminum bronze

WELDING MACHINES
a.c. transformers • d.c. engine driven welders
d.c. rectifiers • inert arc welders
d.c. motor generators

WELDING ACCESSORIES
holders • helmets • cable • gloves
ground clamps • lugs • cleaning tools
Tempilstiks®

THERMIT® WELDING
for fabrication and repair

RADIOGRAPHIC EQUIPMENT
Kel-Ray® Projectors

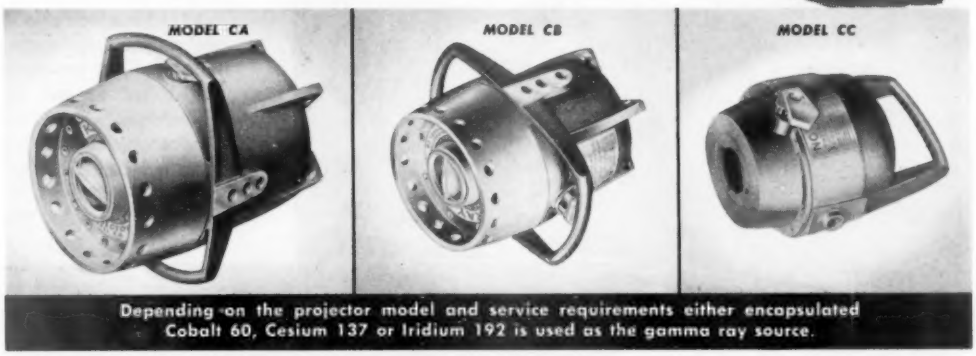
For over 40 years Metal & Thermit has been a leader in the growth of the welding industry. Constantly searching out better materials and equipment, Metal & Thermit has consistently offered the latest means for improving welding efficiency, cutting welding cost.

The sign of another new M & T product indicates progress in welding. Behind it is the most complete arc or Thermit welding package available through any one source. Ask your nearby Metal & Thermit dealer or representative for further information, or write.

AWS SHOW

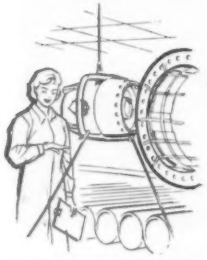
another NEW product

The KEL-RAY® Projector* a safe versatile tool for Radiography with gamma rays . . .



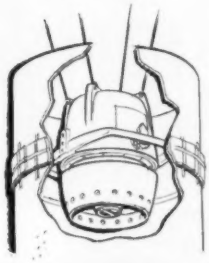
Depending on the projector model and service requirements either encapsulated Cobalt 60, Cesium 137 or Iridium 192 is used as the gamma ray source.

NON-DESTRUCTIVE INSPECTION and TESTING



SAFE

KEL-RAY projectors have extremely low radiation leakage. . . so low they can be shipped and stored without additional shielding. They are tamper, fire, and shock proof. Operated under prescribed procedures, leakage is below the AEC limit.

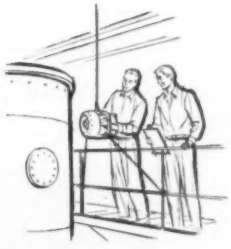


VERSATILE

A single set-up can produce either spot, doughnut, or hemisphere panoramic radiographs. Thick steel sections can be radiographed; sensitivity is so great even incandescent lamp filaments have been radiographed with a KEL-RAY projector.

CONVENIENT

Designed for field or shop use, the smallest model can be carried by hand—largest is transported and positioned speedily with standard equipment for materials handling and rigging.



ECONOMICAL

Initial and operating costs are low. No delicate parts to pamper or adjust . . . no expensive electrical power source required. Minimized overall set up and exposure time provide further savings.

Each of the three KEL-RAY Projector models is a portable, powerful, shielded, self-contained source of penetrating radiation for non-destructive inspection in maintenance, construction or quality control. There is a KEL-RAY Gamma Ray Projector that can improve your operations —save you time and money! Write for detailed literature.

* KEL-RAY is a trade mark of The M. W. Kellogg Company, designers and manufacturers of the KEL-RAY Projector.

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PRODUCTION TOOLS WITH AN *Electro-magnetic Base*

PORTOMAG LIFT AND CLAMP—Now solve annoying plate alignment problems with this new portable electro-magnetic welding clamp with magnetic pulling power up to 5000 lbs. Speed welding operations with a welding device which converts quickly to a magnetic lift.

PORTOMAG DRILL—Bring drill press accuracy right to the job with this new completely portable drill . . . easily . . . quickly . . . safely. Equipped with an electro-magnetic base with a pulling power up to 1900 lbs.

PORTOMAG ANGLE CLAMP—The modern and completely versatile solution to difficult angular welding situations. Each magnetic base with a pulling power of 1000 lbs. Save production time and obtain quality welding results with the PORTOMAG Angle Clamp.

SEE THESE PORTOMAG TOOLS DEMONSTRATED AT THE BUFFALO WELDING SHOW—BOOTH 25

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WRITE US NOW FOR AN "ON-THE-JOB" DEMONSTRATION OR LITERATURE FREE!

Aluminum sheet and plate alloys

Types		Alloy Symbols	Major Alloying Elements (Full Gauge or Core)	Cladding Alloy	Forms Produced	Federal Specification	Military Specification	ASTM Specification	Aeronautical Materials Specification
Non-Heat-Treatable Group	Common Types	1100	99% Min. Al.		Plate-Sheet	QQ-A-561b		B209-54T	4001B-4003B
		1180	99.8% Min. Al.		Foil				
		1187	99.87% Min. Al.		Foil				
		1235	99.35% Min. Al.		Foil				
		3003	Mn.		Plate-Sheet Foil	QQ-A-359c		B209-54T	4006B-4008B
		Alclad 3003	Mn.	7072	Plate-Sheet Foil			B178-54T	
		3004	Mn. — Mg.		Plate-Sheet			B209-54T	
		Alclad 3004	Mn. — Mg.	7072	Plate-Sheet			B178-54T	
		5005	Mg.		Plate-Sheet				
		5050	Mg.		Plate-Sheet			B209-54T	
		5052	Mg.		Plate-Sheet	QQ-A-318b-1		B209-54T	4015B-4016B 4017B
		5154	Mg.		Plate-Sheet		Mil-A-17357-A1		4018-4019
		Alclad X5155	Mg.	7072	Plate-Sheet				
		5357	Mg.		Sheet				
	Brazing Sheet	No. 1	Mn.	4043	Sheet				
		No. 2	Mn.	4043	Sheet				
		No. 11	Mn.	4343	Sheet		Mil-A-20148		
		No. 12	Mn.	4343	Sheet		Mil-A-20148		
		No. 21	Mg.	4343	Sheet		Mil-A-20148		
		No. 22	Mg.	4343	Sheet		Mil-A-20148		
	Reflector Sheet	6951	99 3% Min. Al.		Sheet				
		No. 2	99% Min. Al. or Mn.	1175	Sheet				
Heat-Treatable Group		Alclad 2014	Cu—Si—Mn Mg	6003	Plate-Sheet	QQ-A-255-1		B209-54T	
		2024	Cu—Mg—Mn		Plate-Sheet	QQ-A-355-b		B209-54T	4035C
		Alclad 2024	Cu—Mg—Mn	1230	Plate-Sheet	QQ-A-362a-2		B209-54T	4040D-4041D 4042D
		6061	Mg—Si—Cr		Plate-Sheet	QQ-A-327a-1		B209-54T	4025B-4026B 4027B
		Alclad 6061	Mg—Si—Cr	7072	Plate-Sheet				4021A-4022A 4023A
		7075	Zn—Mg—Cu—Cr		Plate-Sheet	QQ-A-283-1		B209-54T	4044A-4045A
		Alclad 7075	Zn—Mg—Cu—Cr	7072	Plate-Sheet	QQ-A-287-1		B209-54T	4047A-4048A 4049A
		X7178	Zn—Mg—Cu—Cr		Plate-Sheet		Mil-A-9180		
		Alclad X7178	Zn—Mg—Cu—Cr	7072	Plate-Sheet		Mil-A-9183A		4051-4052

Plate is a solid section having a thickness of 0.250 in. or greater; two parallel surfaces brought to final dimensions by rolling, and two longitudinal and two transverse edges brought to final width and length by shearing or sawing.

Sheet is a solid section having a thickness range from 0.006 to 0.249 in., depending upon the particular non-heat-treatable alloy. For heat-treatable alloys, the minimum available thickness commercially established is 0.016 in. Sheet has two parallel surfaces brought to final dimensions by rolling; two longitudinal edges brought to final width by shearing or slitting, and two transverse edges brought to final length by shearing.

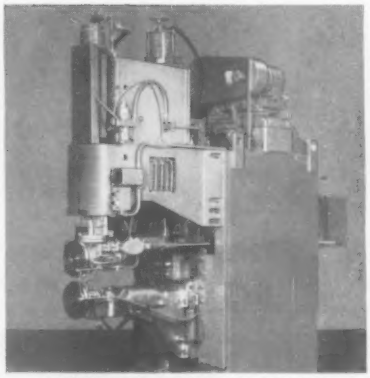
—Courtesy Reynolds Metal Co.

THOMSON

HANDLE RECEIVERS are attached to stainless steel pans — a typical projection welder application. Result: high production, low unit cost, strong welds, no marring of high finish.

NEW SPOT WELDERS

Model RA Spot Welders extend the complete line—provide low cost equipment for utility or production work.



THOMSON SEAM WELDERS

Sizes range from 50 to 400 KVA. Models for circular, longitudinal or universal seaming to exacting specifications.

"SYNCHRO-MATIC" FLASH WELDERS

This exclusive THOMSON development has set new standards for flash-butt welding nonferrous as well as ferrous metals.

specialists in the broad field of RESISTANCE WELDING EQUIPMENT

The THOMSON line is truly complete — ranging from simple, low cost, standard machines to highly specialized production welding equipment. It includes all standard resistance welding types — spot, projection, seam and flash-butt — as well as electro-brazing, electro-forging, upsetting and related equipment.

THOMSON also offers complete engineering, laboratory and experimental facilities to help develop the most effective welder for any application — plus an organization of capable representatives in all metalworking centers to make this service conveniently available to you.

Keep THOMSON in mind when you need resistance welding equipment, technical assistance or the recommendations of the foremost resistance welding specialists.

VISIT BOOTHS 118-119 WELDING SHOW **BUFFALO, N. Y., MAY 9-11**

FOUNDED IN 1886 BY ELIHU THOMSON

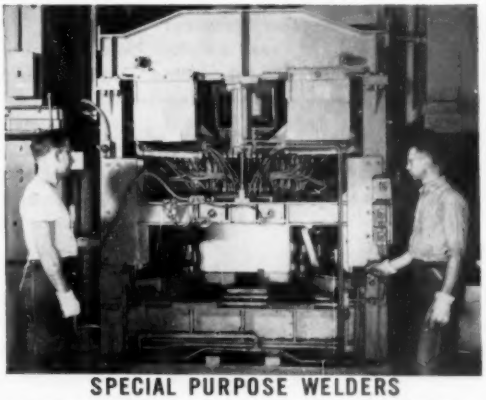
INVENTOR OF RESISTANCE WELDING

THOMSON *Welders*

THOMSON ELECTRIC WELDER COMPANY, LYNN, MASS.

WIRE FABRIC WELDERS

Typical of the many special THOMSON designs which have become standard in their fields of application.



SPECIAL PURPOSE WELDERS

Designed to do one job in the most effective, economical way. Automation applied to resistance welding.

HOLDING down a quiet corner, R. B. Swope and L. W. Stettner review convention proceedings.

MAYOR Poulson (right) of Los Angeles shares a joke with IAA members James Dunham, Robert Swope, E. A. Daniels and C. G. Andrew (left to right).

Los Angeles greets IAA conventioneers

By T. B. Jefferson

MEETING in Los Angeles on March 12-14, the International Acetylene Association elected Clarence M. Pitts to the office of Association president. Mr. Pitts, of The People's Gas Supply Co., Ltd., Ottawa, Canada, succeeds J. Carl Bode, who died in November, 1955.

Other IAA executives elected during the three-day meeting were Vice President Eugene Easterley of Linde Air Products Co., New York City; Walter Bender of Shawinigan Products Corp., New York City, who was re-elected treasurer, and H. F. Reinhard of Linde Air Products Co., re-elected as secretary.

Mayor's Greeting

Although the convention opened at 10 a.m. on March 12, real activity did not begin until the noon luncheon, at which the Honorable Norris Poulson, mayor of Los Angeles, extended a civic welcome to all Association members.

The 50 luncheon guests were given an insight into the future of air travel by Dan A. Kimball, president of Aerojet-General Corp., Azusa, Calif. Mr. Kimball, secretary of the Navy under the Truman administration, was well qualified to speak on the subject, "Where are we going with rockets?"

The speed and scope of the rocket development program, as outlined by Mr. Kimball, made an obvious impression upon his audience. The speaker predicted that manned satellites would be sent into space within the next 10 years to circle the earth at speeds greater than 10,000 mph. He also envisioned rocket transportation that will take high flyers from New York to Los Angeles in a mere half-hour or so.

According to Mr. Kimball, one of the most urgent needs of the rocket industry today is liquid acetylene that can be used for rocket fuel along with liquid oxygen. Such an oxyacetylene-powered rocket would solve many fuel problems presently confronting the rocket industry.

Technical Sessions

Simultaneous technical sessions were held Tuesday afternoon. One was devoted to transportation and the other to petroleum. Both were industrial sessions, however, which pointed out how important the oxyacetylene processes are, not only in the maintenance of transportation systems, but in maintenance of oil industry tools.

Speakers likewise demonstrated that without the oxyacetylene processes, it would be extremely difficult to produce the equipment of our major transportation arteries. It would be equally difficult, if not impossible, to make the equipment needed by refineries to produce high octane gas.

In a single session on Tuesday morning, the problem of education was discussed by three well-informed speakers. It was admitted that many problems existed and that industry could do much to alleviate the situation.

NEWLY elected president of IAA, C. M. Pitts (left), stops between sessions to chat with members.

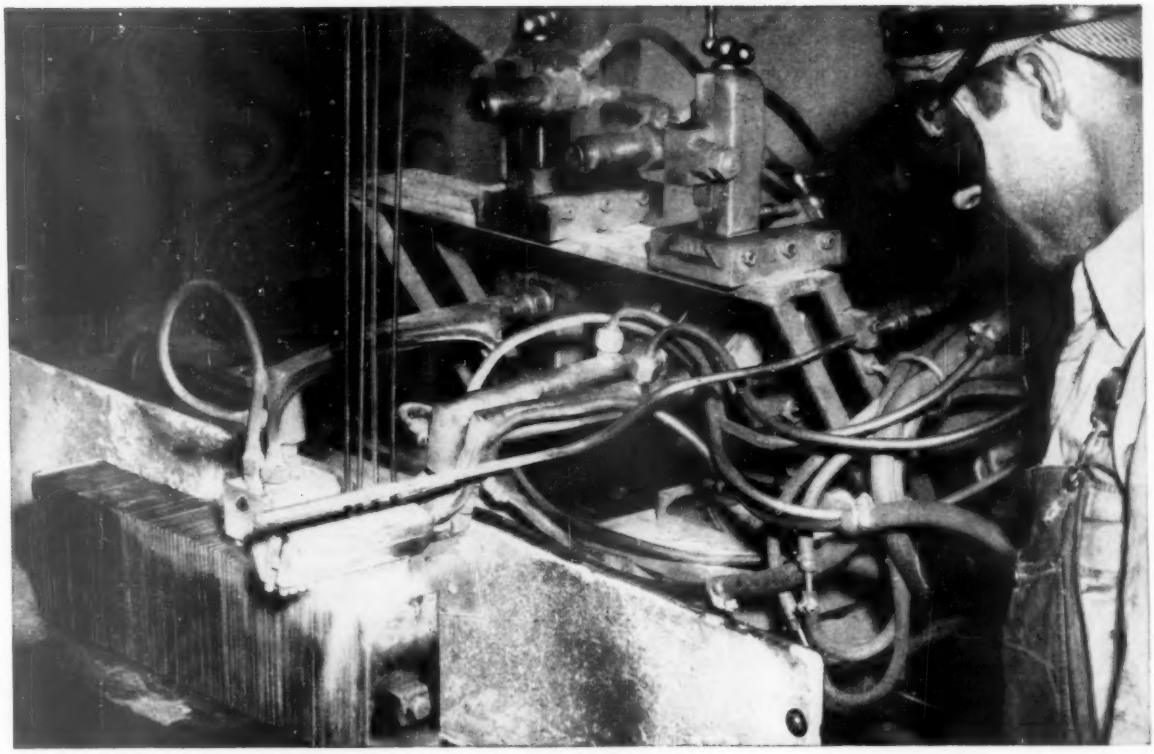
The problem, however, resolves itself upon the point of getting proper cooperation between industry and the educational system. It is sure to come. The question is, how long will it take?

Again on Tuesday afternoon, there were simultaneous sessions devoted to welding engineering and shop operations, and to special applications. Participants in these sessions reviewed the importance of welding and cutting by the oxyacetylene method in all types of industry.

Morehead Medal Award

Highlight of the convention was the Morehead Medal dinner, at which Dr. George B. Slottman, vice president and director of research for Air Reduction Co., Inc., was honored for his scientific contribution to carbide, acetylene and oxygen technology.

Dr. Slottman is the 34th receipient



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Hard-facing with HAYSTELLITE tube rod has increased the life of hammers used in a heavy duty grinder by four times. The hammers rotate at from 3000 to 3600 revolutions per minute while pulverizing metal turnings, limestone, glass, mica, and other severe abrasives. They are hard-faced mechanically on a model 800 straight-line machine. 70 hammers are processed at a time, and 1000 hammers are hard-faced in a normal working day.

HAYSTELLITE rod, the hard-facing material used on the hammers, forms an extremely hard surface that has good resistance to impact. It produces a deposit consisting of sharp, irregularly shaped particles of cast tungsten carbide evenly distributed in a matrix of tough steel. The tungsten carbide particles resist abrasion, and the steel matrix cushions the effects of sudden shock.

There are 15 HAYNES hard-facing alloys . . . a wide selection that guarantees you the right rod at the right price for every wear problem. The HAYNES Hard-Facing Manual describes these alloys in detail, and outlines recommended procedures for applying them. We shall be happy to send you a copy upon request.

We also design and produce mechanized hard-facing equipment. For a description of the process and available equipment ask for "Mechanized Hard-Facing" Form 8564.

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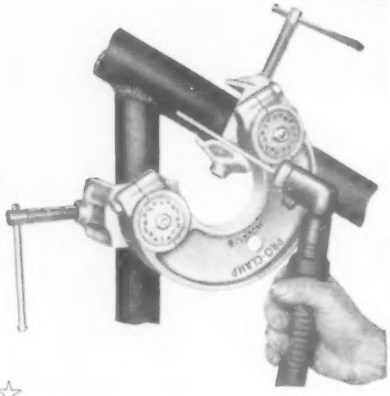

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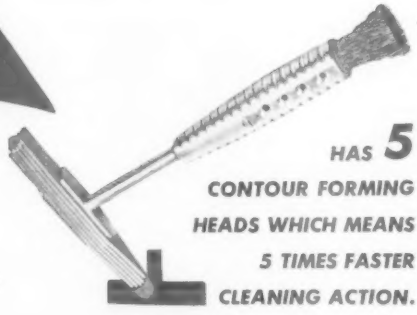

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of this coveted award, which was established in 1922 by John Motley Morehead to honor his father, the late James Turner Morehead. In 1892, the elder Morehead sponsored experiments leading to the discovery of the electric-furnace method of producing calcium carbide.

Presented annually by IAA officers and directors to the person who "has done most to advance the acetylene industry or the art of producing or utilizing calcium carbide or its derivatives," the Morehead Medal is the Association's foremost award.

Reports and Elections

Wednesday morning was devoted to the Association's business session. The usual committee reports, as well as those of the secretary, treasurer and consulting engineer, were given. This session was followed by the election of officers and directors.

Newly elected to the board of directors were C. G. Andrew, Air Reduction Sales Co., New York City, who will serve for three years, and P. F. Lavedan, Liquid Carbonic Corp., Chicago, who will serve for one year.

L. W. Hench, American Oxygen Service Corp., Harrison, N. J., and Andre Lot, Canadian Liquid Air Co., Ltd., Montreal, were re-elected as directors for three-year terms.

Other directors whose terms of office have not yet expired include C. E. Monlux, Linde Air Products Co., New York City; R. B. Swope, Southern Oxygen Co., Inc., Washington, D. C.; E. A. Daniels, Victor Equipment Co., San Francisco; J. L. Adank, National Cylinder Gas Co., Chicago and William Josephian, Pacific Oxygen Co., Oakland, Calif.

The IAA'S Executive Committee remains unchanged. Serving under chairman J. J. Lincoln, Jr., of Air Reduction Co., New York, are C. E. Monlux, L. W. Hench and R. B. Swope.

Until Next Year

Following the business meeting and the elections, members engaged in a "technical know-how exchange session," devoted to advancing the latest developments in the industry through an interchange of ideas.

The exchange session concluded the three-day convention. The 57th annual convention will be called to order at the Hotel Nicollet in Minneapolis on Apr. 8, 9 and 10, 1957.

AUTOMATIC TORCHES

THE HEART OF ECONOMY

Approved by Underwriters' Laboratories

BY ACTUAL COMPARISON

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USING HARRIS AUTOMATIC TORCH . . . . 28 Pieces Welded

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HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

—*Courtesy International Nickel Co.*

AT far left, weldor and helper repair lamp post with coated nickel electrode. Second photo shows neat welds requiring only slight finishing before painting.

Lamp post mayhem

THE LAMP posts of Forest Hill Gardens, N. Y., may look somewhat different from those in some other towns and cities throughout the U. S. but they are subject to the same "beasts of prey"—automobiles.

On an average of once every 6 or 8 weeks—or about 75 times in the last 10 years—these unsuspecting cast iron posts have been shattered by auto bumpers.

The guilty driver, in many cases, goes scot free leaving the city corporation to face maintenance expenses —approximately $600 for a new post. Frequency of accidents eliminated total replacement as a solution, so the city called in General Welding Service of Elmhurst, N. Y., to repair the damaged posts.

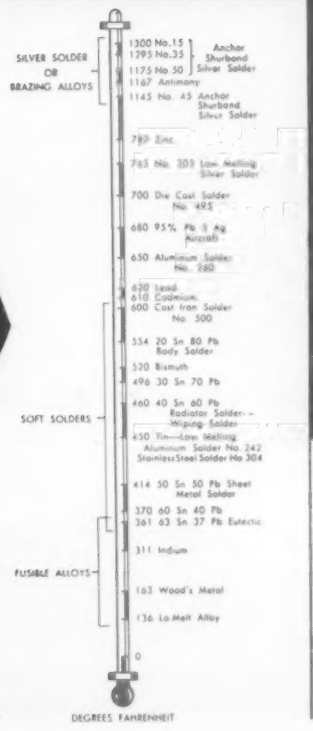
On the job within thirty minutes to prevent possible child injuries from jagged edges or live wires, the service weldor uses a coated nickel electrode for repair work. This electrode leaves a machinable deposit, so that finished welds are scarcely noticeable when the post has been repainted.

Welding repairs usually are made in two or three hours, and at an average cost of less than $50. Forest Hill Gardens Corporation, then, has realized a savings of thousands of dollars over the years.

ONE SOURCE for ALL your SOLDER-JOINING needs...

ANCHOR

ANCHOR Solder Alloy Selection Chart


SILVER SOLDER OR BRAZING ALLOYS
1300 No.15
1295 No.35
Anchor Shurbond Silver Solder
1175 No 50
1167 Antimony
1145 No. 45 Anchor Shurbond Silver Solder
787 Zinc
765 No. 305 Low Melting Silver Solder
700 Die Cast Solder No. 495
680 95% Pb 5 Ag Aircraft
650 Aluminum Solder No. 280
620 Lead
610 Cadmium
600 Cast Iron Solder No. 500
554 20 Sn 80 Pb Body Solder
520 Bismuth
496 30 Sn 70 Pb
460 40 Sn 60 Pb Radiator Solder—Wiping Solder
SOFT SOLDERS
450 Tin—Low Melting Aluminum Solder No. 242 Stainless Steel Solder No 304
414 50 Sn 50 Pb Sheet Metal Solder
370 60 Sn 40 Pb
361 63 Sn 37 Pb Eutectic
311 Indium
FUSIBLE ALLOYS
163 Wood's Metal
136 Lo-Melt Alloy
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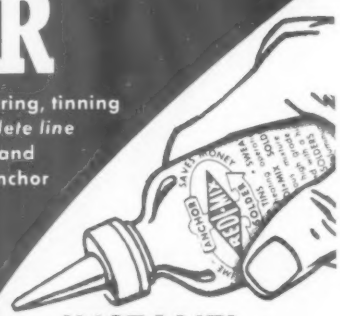
You do *faster, easier, safer* soldering, tinning and brazing with Anchor's *complete line* of solder products (see chart) — and you save money, too. Because Anchor has the better know-how to produce better products at lower cost to you. PROVE this for yourself, at no obligation. Fill in the coupon now.



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cleaning, fluxing and soldering of all common metals, except aluminum & magnesium, without need for separate flux and solder! ANCHOR's new Redi-Mix solder-and-flux paste in unbreakable plastic squeeze bottle — another ANCHOR FIRST!

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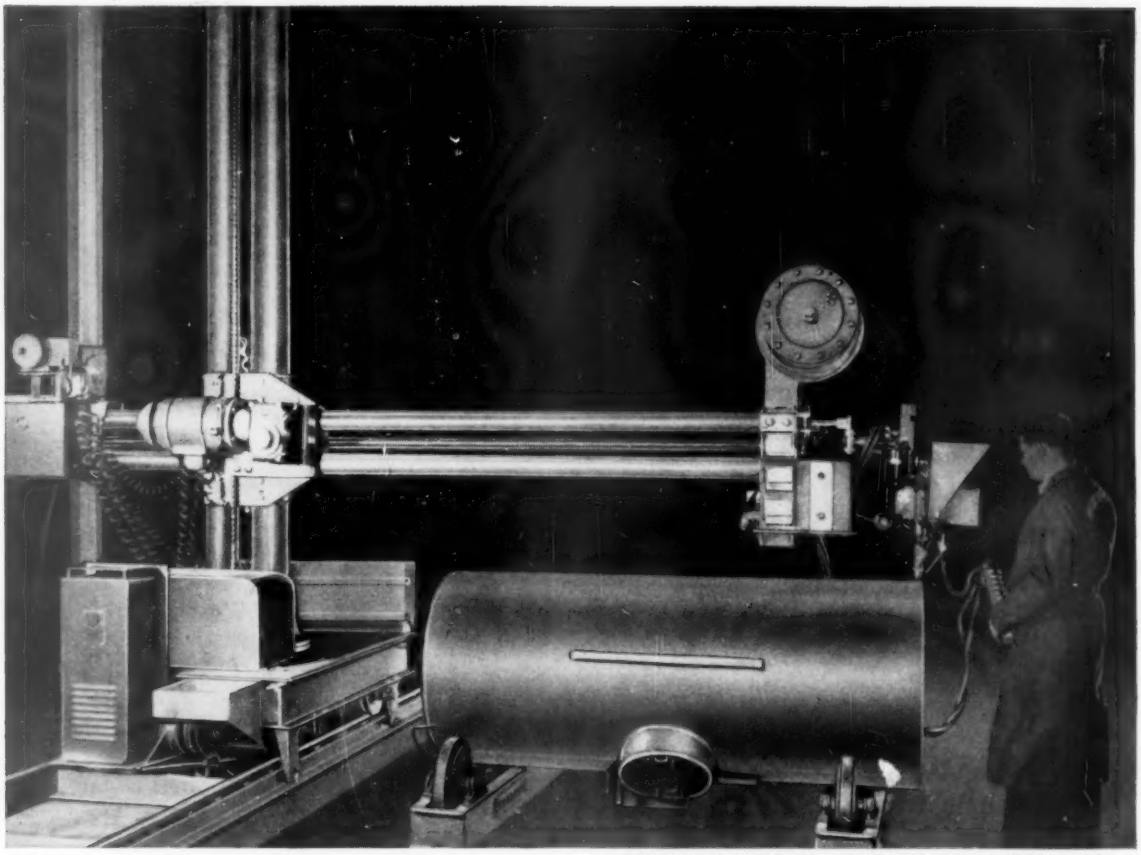

PRECISION WELDING HEAD MANIPULATOR completes Worthington's welding equipment line. Supplied with welding head and accessories of customer's choice.

Announcing...
new automatic welding head manipulator

Only Worthingon now offers complete equipment line plus nationwide sales and service

Now you can get all the basic equipment you need for your automatic welding operations from Worthington.

With the addition of this new, custom-manufactured precision-designed welding head manipulator to its line of welding positioners and turning rolls, Worthington now offers a complete packaged deal to automatic welding equipment users.

What's more, Worthington is the *only* manufacturer offering all the equipment you need—*plus a nationwide sales and service organization.* You get the equipment you need *when* you need it—and we're there to see that it works *after* you get it. Bring your positioning problems to Worthington for a quick solution.

Find out how the new Worthington packaged positioning equipment deal can help you. Write today for free literature to Worthington Corporation, Positioning Equipment Division, Section Y.6.1, Harrison, New Jersey.

Y.6.1

WORTHINGTON

Drop in and see us at the Welding Show, Buffalo, May 9-11. Booth No. 223

With preformed rings and washers in exact shape to fit your job, you can increase your brazing production. These shaped rings and washers are now produced by Handy & Harman in Easy-Flo and Sil-Fos—the original and time-tested silver brazing alloys.

Add to these fine products, the services of the Whitehead Technical Man whose job it is to help you with equipment and techniques, then you have a money-saving combination that's hard to beat.

For technical service, for Handy & Harman silver brazing alloys, for the best in welding materials or anything in the corrosion-resistant materials field, call your nearest WHITEHEAD Warehouse.

Meanwhile write for Bulletin HH-5

WHITEHEAD METAL PRODUCTS COMPANY, INC.

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See us at Booth 229, at The WELDING SHOW

Speedboats are welded for safety

MANUAL arc welding is used to fabricate all-steel speedboat hulls.

—Courtesy Jones & Laughlin Steel Corp.

BOTTOM plate, of 11-gage steel, is welded to hull of large motorboat. Hull is lighter than comparable wooden craft, yet stronger.

CERTAINLY one of the most important factors contributing to full enjoyment of motorboating is the safety factor.

The sure knowledge that your launch will take a rough chop or heavy seas—or even a fairly serious collision—without disastrous damage adds immeasurably to the fun of a day's outing.

The firm of E. W. and A. P. DuPont, Paterson, La., is capitalizing on the general desire for safer boats by fabricating a line of welded, steel-hulled boats. Designed as pleasure craft, these motorboats have proved they can take a beating that might sink a wooden-hulled craft.

Low-Alloy Steel

The boats, called "SaftiCraft," are made in five sizes, ranging from 26 to 38 ft in length. A high-strength, low-alloy steel is used in fabrication; 11-gage sheets are used on the bottom, and 12-gage sheets on the sides of the boats.

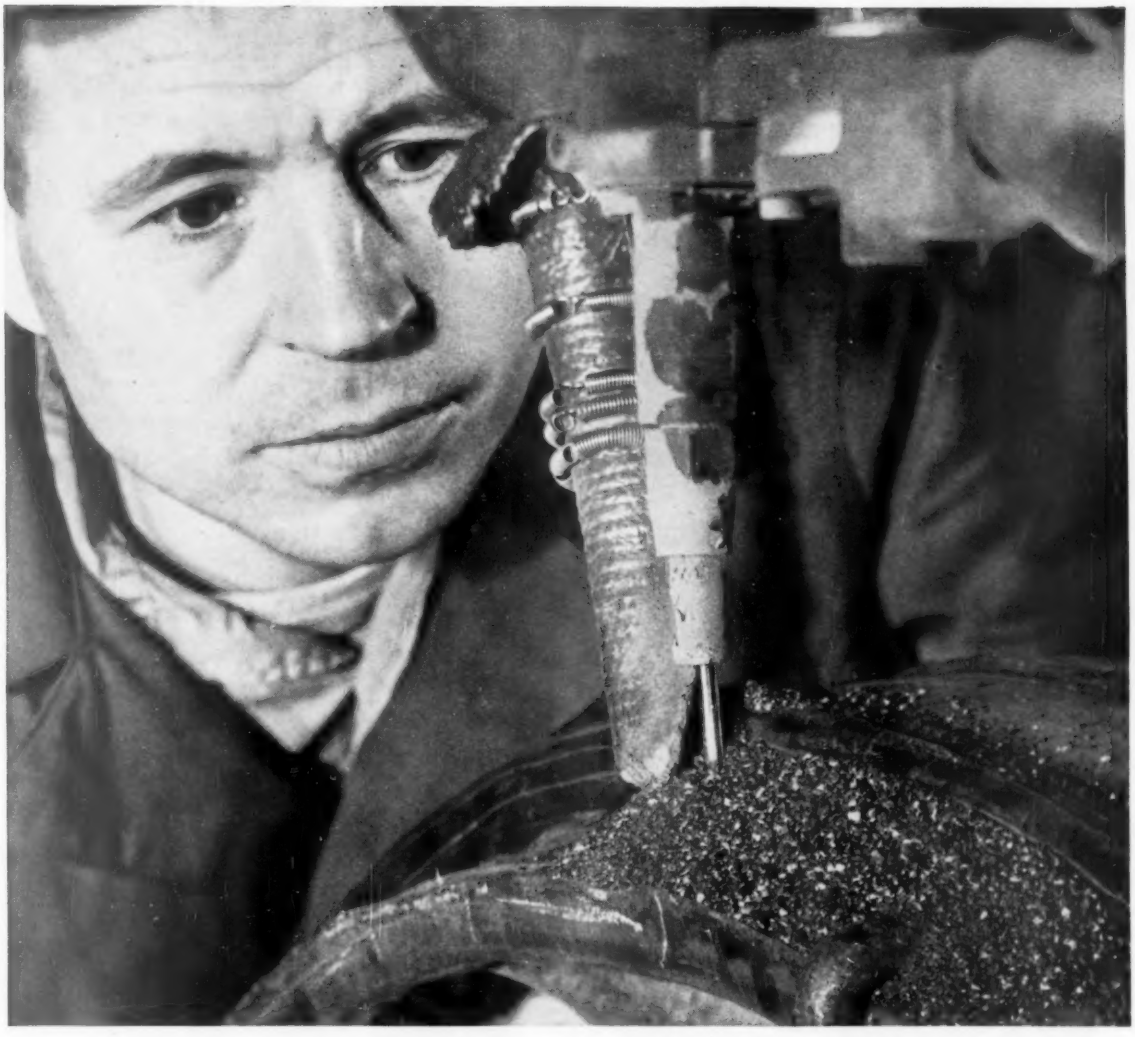
Weldors joining hull components comment favorably upon the manner in which the steel takes welding heat. No ripples or buckled areas have to be straightened out after the welding operation.

The smooth, seamless surface made possible by the use of welding has noticeably reduced drag, and a 20% weight saving has been effected with no loss of strength.

Treated Hulls

Up to 24 boats can be fabricated at one time on DuPont's 300-ft assembly line. Boats destined for use exclusively in salt water receive a special metallizing application with a zinc compound; boats used alternately in fresh and salt water are not treated. All hulls receive five coats of paint.

DuPont, which also fabricates offshore oil drilling structures, modifies many of its boats for service use by oil derrick crews working over the tidelands oil deposits. Coming alongside a "Texas tower" in heavy seas is a hazardous operation, and the welded steel construction gives a large measure of protection against unavoidable collisions with the structure.



How Tractor Operators **Save 50% on Parts Replacement Costs**

Build-up and hardfacing with Amsco® Automatic Welding saves money, doubles service life

The operator shown here is depositing Amsco AW-79 . . . to build up cash savings for tractor operators.

By rebuilding and hardfacing with Amsco Automatic Welding, he is adding *double the service life* of the original part . . . at about *half the cost* of a replacement part.

The Amsco "550" Automatic Welder is specially designed for this heavy-duty service. And Amsco AW-79 Alloy Steel Electrodes provide high impact and abrasion resistance.

Both large contractors and repair shops can make the Amsco "550" pay for itself in short order. Ask your Amsco Distributor for full details on the "550" Automatic Welder and the full line of Amsco Hardfacing Electrodes.

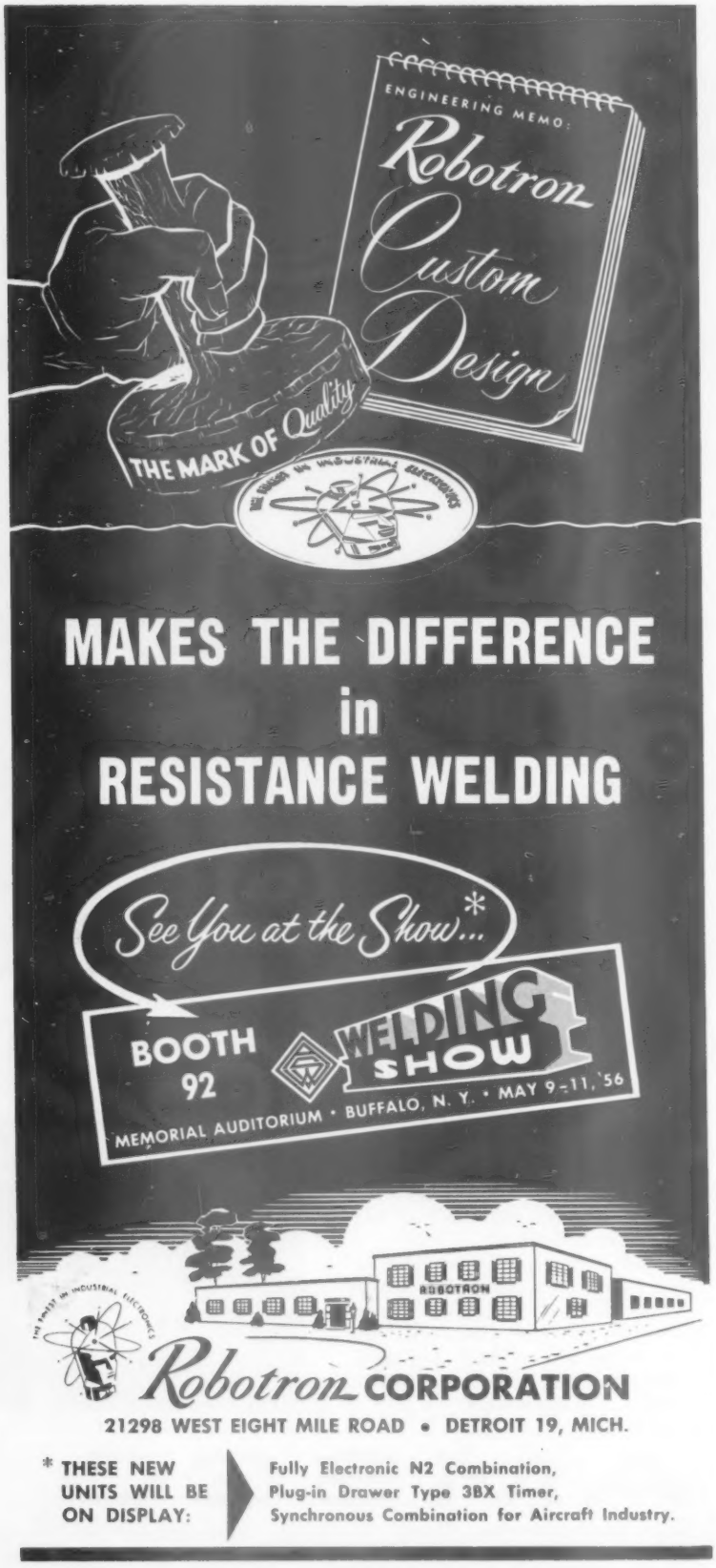
Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division · Chicago Heights, Ill.

OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DELAWARE, OAKLAND, ST. LOUIS; JOLIETTE, QUEBEC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MAKES THE DIFFERENCE
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See You at the Show...*
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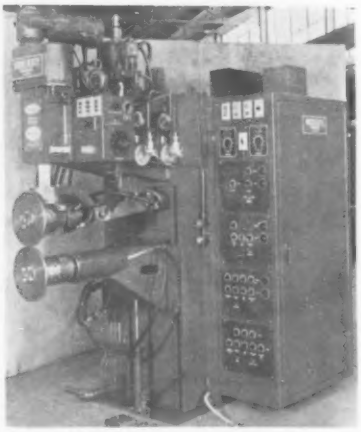
* THESE NEW UNITS WILL BE ON DISPLAY:
Fully Electronic N2 Combination,
Plug-in Drawer Type 3BX Timer,
Synchronous Combination for Aircraft Industry.



DEKATRON timer in new seam welder gives consistent weld control.

Seam welder has dekatron timing control

A TIMING control for resistance welding which counts cycles of line frequency has been developed by Sciaky Bros., Inc., Chicago. The dekatron tube is the nucleus of this new device, the accuracy of which is said to parallel power company line frequency requirements.

A cold-cathode type of gas tube, the dekatron has ten cathodes with two guide pins between each pair of cathodes. When power is applied to the tube, a negative voltage is applied to the cathode to be fired.

During the counting operation, pulses are fed to guide pins and the glow is transferred from one cathode to the next until the count—from one to ten—has been completed.

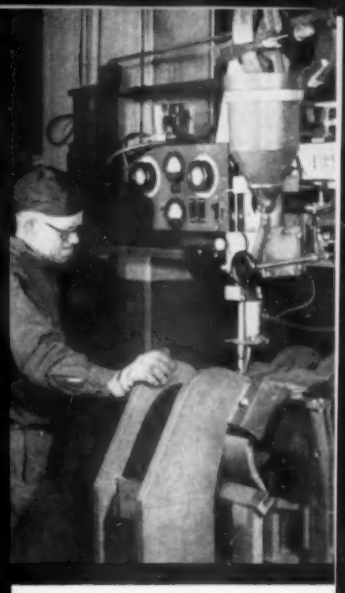
Addition of a decade dekatron increases possible count to a hundred, and a third tube will enable a maximum count of 1,000.

Minimum maintenance down-time reportedly will be achieved by the use of plug-in sub-assembly units, which are neatly cased in the seam welder control cabinet.

All welder functions, controlled by two dekatron tubes, are synchronous, and all control dials for timing operations are calibrated in cycles. Control dials for interval functions are calibrated in impulses of secondary current.

Production Doubled

...Costs Cut in Half with HOBART'S New "Simplified" Automatic Arc Welder



Half the Cost is saved in producing stator housings formerly done by manual type welding. One of many production operations where automatic welding proves profitable.

Now it's easy to use automatic welding without the necessity for elaborate and expensive setups.

No more complicated installations with troublesome, delicate electronic and electrical controls.

With Hobart's new "POWROMATIC" constant voltage unit and "simplified" controls, inexperienced men can produce high quality welds at production speeds that will amaze you.

Hobart's modern, simplified control system eliminates the troublemakers and makes it possible for the operator to maintain steadier production at a much faster rate per day.

You'll quickly realize WHY a Hobart Automatic Arc Welder minimizes your "down time" and "re-weld" losses, once you see the principles of Hobart's design and construction, and the many advantages it has to offer.

It costs you nothing to investigate. Why not see what automatic welding can do for you? Ask for bulletin AU1200F.

HOBART BROTHERS COMPANY
Box U-562, Troy, Ohio, Phone 21223

"One of the world's largest builders of arc welding equipment"

HOBART TROY OHIO WELDERS

- Electric Motor Drive
- Gas Engine Drive
- Self-propelled
- DC Rectifier
- AC Transformer
- Automatic Arc Welders
- Semi-automatic Arc Welders
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Without obligation, please send me complete information on items checked below.

☐ Complete information on Hobart CV POWROMATIC and Heads for Automatic Welding. ☐ Tell me how we can simplify Automatic Welding with our present heads by using Hobart POWROMATIC. ☐ Send latest HOBART Simplified Arc Welder Catalog.

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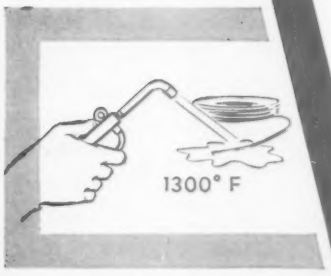
Right down the line

UNITED'S PHOSON alloys

Right every time for brazing copper and brass



Here's Why:

Lowest practical brazing temperatures. There's a Phoson Alloy to meet your every requirement.

Super-Strength—Corrosion Resistant. Joints are stronger than metals brazed. Original tensile from 86,000 p.s.i. Highly resistant to most types of corrosion and generally equal to copper itself.

Join better by brazing Join best with PHOSON or SIL-BOND.

Choose Sil-Flux for every fluxing need.

High Capillary Attraction and Versatility. Provides outstanding free flow and deep penetration. Ideal for preplacement or face-fed application. Efficient in both tightly-fitted or more loosely-fitted joints. Phoson Alloys are available in straight lengths, coils or preformed rings. *Contact your United Welding Supply Distributor or write*

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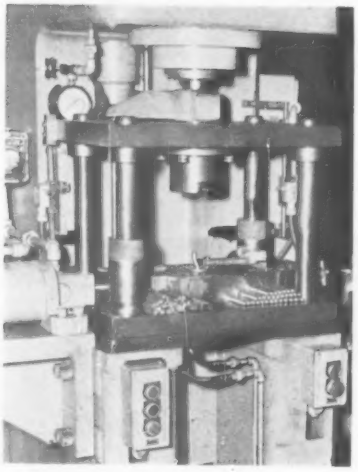
LOOK TO UNITED FOR THE BEST IN ALUMINUM, COPPER AND BRASS TUBE AND WIRE.



OFFSET spot welding tip has been neatly bent on hydraulic press.

Cold bending spot welding tips

COLD-BENT, offset spot welding tips are being produced from standard straight tips by Ampco Metal, Inc., Milwaukee, Wis. A press with two hydraulic cylinders—one acting in a vertical, the other in a horizontal direction simultaneously—does the job. The tips may or may not have water in them.

The morse taper of a standard straight weld tip matches the female taper socket of the lower press die over which it is fitted. A water tube in the socket of the lower press die fits vertically into the water hole of the weld tip.

The upper press die has a similar socket which fits over the top of the weld tip when the die is lowered to give vertical bending pressure. As this occurs, a horizontal hydraulic cylinder moves the lower die sideways to a pre-set offset distance

Spot welding tips in lengths up to 6 in. can be offset as much as 4 in. on the press. After bending, tips are automatically ejected from the machine.

Cooled right to the welding face, the tips have the properties of cold-drawn rod and are superior to castings or forgings. Economy is achieved through elimination of pattern or forging die charges, and by avoiding the high cost of machining irregular tips.

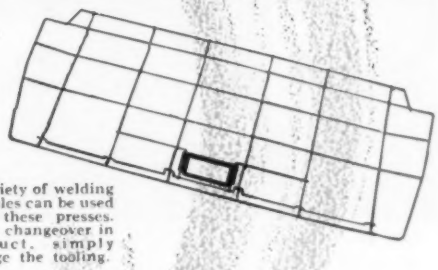
FEDERAL WELDING PRESS . . .

a complete seat frame with every press stroke!

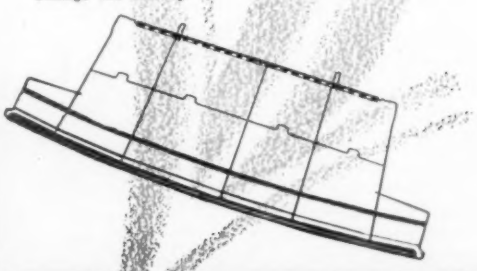
Frames for automobile seat backs and cushions are being resistance welded on Federal Welding Presses at the Great Lakes Spring Division of Rockwell Spring and Axle Co.

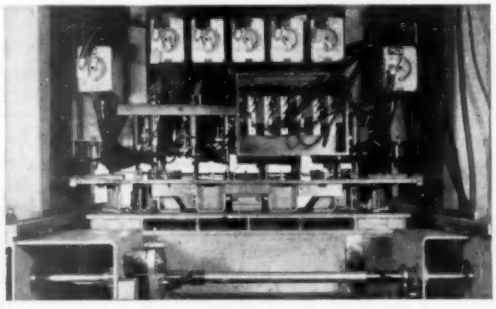
Only Federal can offer single company responsibility in supplying both the mechanical welding press and the welder tooling based on their long experience in both press (Warco) and resistance welder (Federal) manufacture.

There are many manufacturing operations existing today where a mechanical welding press would pay dividends. If you have one of them, why not contact the one company best suited to provide the answer? That's *Federal — First in Resistance Welding*. Welding Press brochure on request.

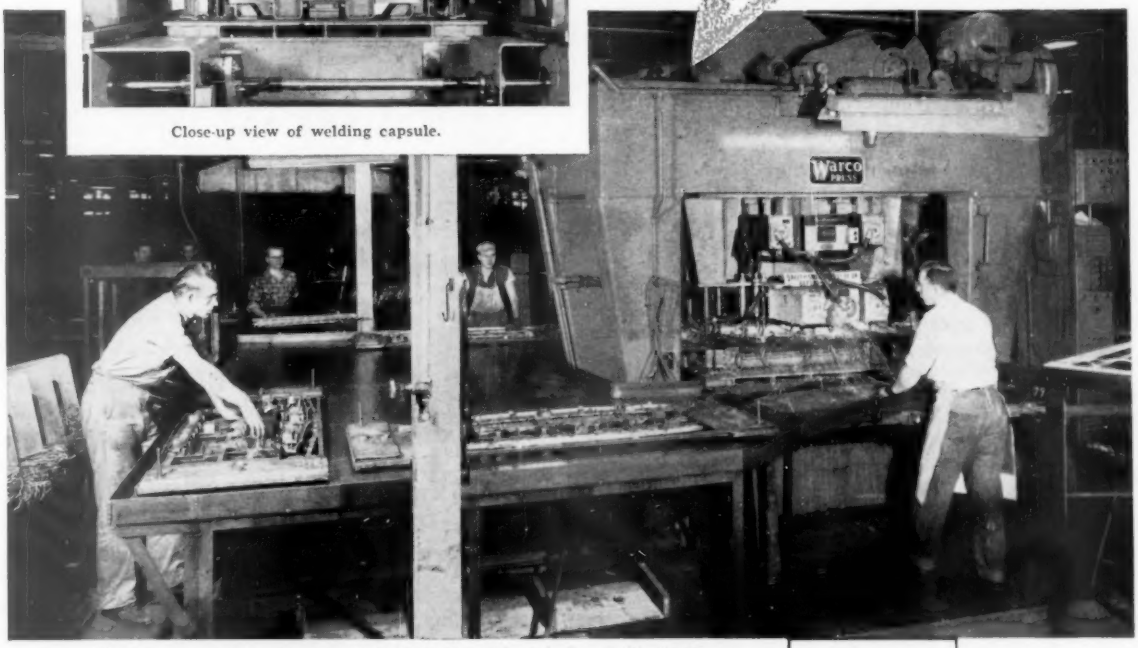


A variety of welding capsules can be used with these presses. For a changeover in product, simply change the tooling.





Close-up view of welding capsule.



There's no comparison between the old single weld method and this "automated" production line made possible through the Federal Welding Press.

SEE US IN BOOTH 73 AT THE WELDING SHOW

Federal® WELDERS

9967

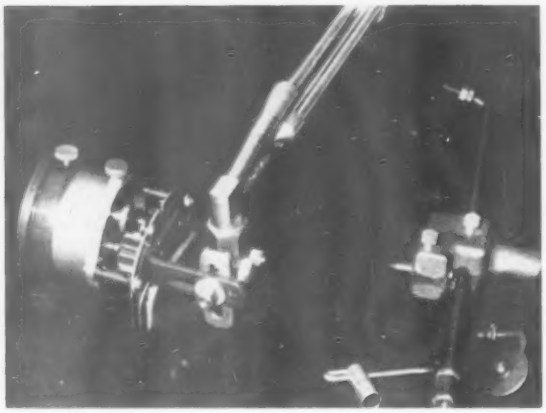
The Federal Machine and Welder Company

WARREN, OHIO

Warco PRESSES®

new products . . . . . USE CARD ON PAGE 149

SEMIAUTOMATIC welding process uses CO_2 gas to shield arc.



SPEED governor attached to cutting torch provides better control.

CO_2 welding

SEMIAUTOMATIC hand gun welding process uses carbon dioxide. Termed "C-OMANUAL," the process involves a hand gun, control unit and 600 amp d-c power source. It is intended for welding mild or carbon steel.

Lightweight hand gun is simple and rugged in design with no O rings. Control console has two-speed automatic head, allowing selection of proper feeds for light or heavy wire. Also has wire reel, feed and speed controls and convenient front control panel. Features of process include visible arc which speeds spotting of nozzle, requiring no flux; automatic control of current; deep penetration and high metal deposits. *A. O. Smith Corp.*

Circle No. 1.

Electrode

ELECTRODE gives X-ray quality welds and allows operation in all positions, it is claimed. The "135 Ni-o-nel" electrode can weld "Ni-o-nel," nickel-iron-chromium alloy.

Electrode comes in 14-in. lengths, in four diameters—3/32, 1/8, 5/32 and 3/16 in. *The International Nickel Co., Inc.*

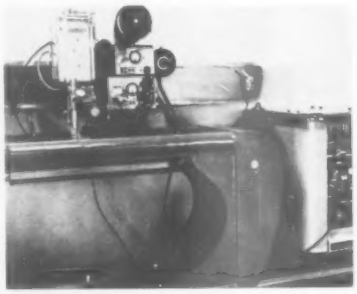
Circle No. 2.

Toggle clamps

LIGHTWEIGHT aluminum toggle clamps are for overhead applications, hard-to-reach places and welding applications where non-magnetic aluminum is desirable, manufacturer states. Aluminum models "441-A" and "491-A" have counterparts in steel, termed "441" and "491."

The 491 types measure 10 in. in length, featuring narrow deep-throated jaws. They are recommended for working in confined areas. The 441 types are 6 in. long, light-duty type and have wide short jaws. Holding pressure of aluminum models is less than steel types, manufacturer points out. But aluminum models are good for work with explosive gases and vapors and for corrosive material. Holding pressures are: "491-A," 500 lb; "491," 850 lb; "441-A," 200 lb; "441," 350 lb. *Detroit Stamping Co.*

Circle No. 3.



Welding fixture

LONGITUDINAL welding fixture, "Model LW, Series 1000," is for fusion welding of flat sheets, cylinders, cones and other shapes. Package unit should prove ideal, it is claimed, for production shops and welding research laboratories.

Features such as foot control, multiple-insert rotating back-up mandrel and adjustable fingers add to flexibility of the machine, states the manufacturer. *Airline Welding & Engineering.*

Circle No. 4.

Flame-cutting

SPEED governor is for use in manual flame-cutting. It is attached to cutting torch, can be handled easily by hand-pulling. Use of the "Gascut" governor enables the operator to control cutting speed.

Reduction gear with heavy-duty centrifugal regulator is said to assure exact speed feed. Clean smooth cut is obtained with sharp angles and without burrs. Fingertip control for cutting speed allows cutting plates from 1/8 to 4-in. thicknesses. Governor can be used with most cutting torches. Can cut any length and angle, straight or round, in one step. Total weight is 4 lb. Manufactured in Sweden. *Harris Service & Repair Corp.*

Circle No. 5.

Paste solder

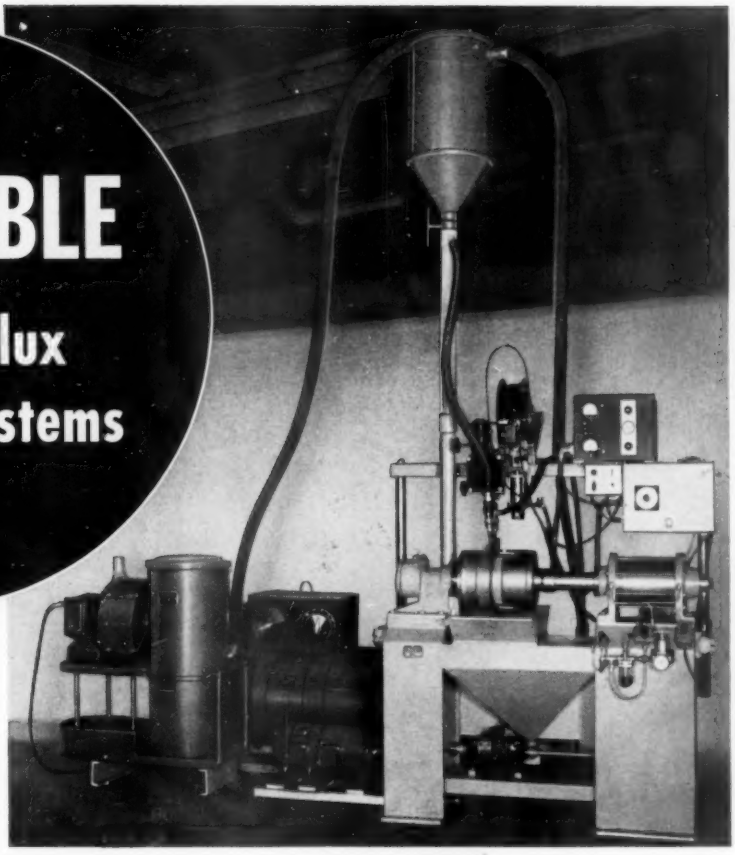
HIGH silver content alloy, blended with special flux, is for overlay, joining, preplacement, tinning, filling. Made in paste form, "Eutec-SilWeld 1618" can be applied with brush or spatula. It is claimed ideal for silver soldering or silver brazing. It can be used on all metals except aluminum, magnesium and white metals.

"Eutec-SilWeld 1618" gives shear strengths up to 125,000 psi. Its finely ground and paste-suspended alloy plus active flux permits bonding at from 25 to 150 F below conventional solders. It is available in 1 and 2-lb jars and 8-oz trial size. *Eutectic Welding Alloys Corp.*

Circle No. 6.

INVINCIBLE

Welding Flux Recovery Systems



This compact set-up includes a primary separator tank and standard Model 460 unit. Compressor parts for a large refrigerator manufacturer are being welded.

Pay for themselves . . . with interest!

Thousands of Invincibles are at work throughout industry . . . salvaging valuable welding flux, saving labor, making the welding operation more efficient. Invincibles repay their cost in a short time, then pay an additional service bonus.

If you have a submerged arc welding job, consider these features of Invincible Flux Recovery Units:

1. Invincibles save valuable flux by recovering *all* loose flux from the work, removing slag or fused particles, and returning the unfused flux to the hopper of the welder. Both manual units and completely automatic (continuous flow), systems are available.

2. Invincibles save costly man-hours—release men for other important work. Invincibles do the job automatically, more rapidly and efficiently than manual methods.

3. Invincibles save you money caused by rejects; by removing all fine dust (flux flour), they speed production and reduce welding rejects.

These Invincible advantages can be applied to your job, regardless of its size or type. Let us send you this *Free Folder* on Flux Recovery. Illustrated case histories show how Invincibles save time and money on installations of all kinds.

INVINCIBLE VACUUM CLEANER MFG. CO.

DOVER, OHIO

OVER 50 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

PROOF of how to get dependable results welding by submerged arc

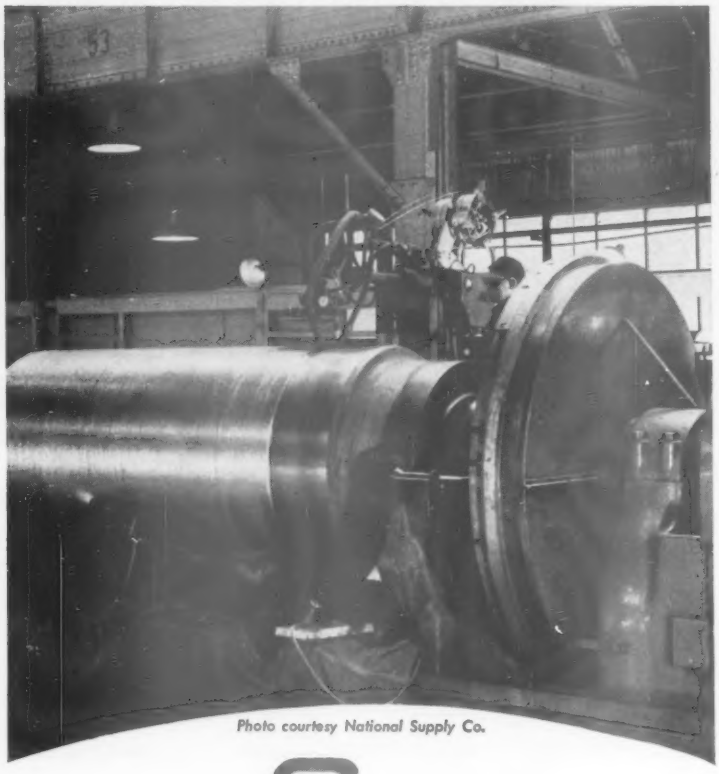
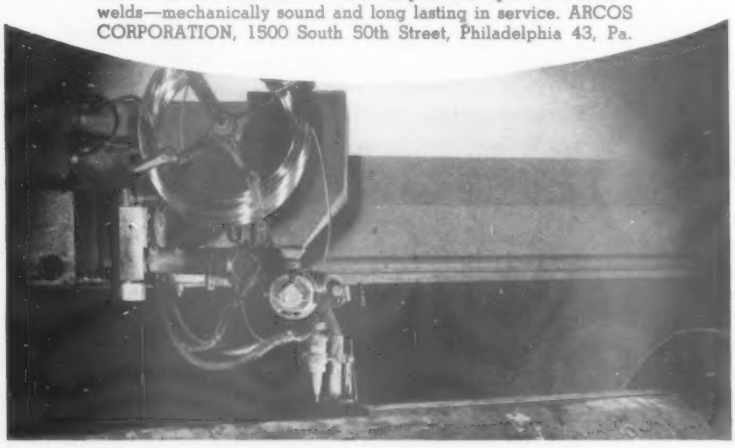


Photo courtesy National Supply Co.

WELD WITH ARCOS

CHROMAR Stainless COILED WIRE

Shown above is a 72,000 lb. Extrusion Ram being overlaid by submerged arc with type 316 stainless weld metal. At the conclusion of the job the entire extensive welded surface was reported sound and crack-free—the same results you can expect with Arcos Chromar Wire on your own jobs. Arcos control of the composition of its Chromar *welding quality* spooled wire assures a transfer of all the elements needed to produce top notch stainless welds—mechanically sound and long lasting in service. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.



Arc cutting torch

AUTOMATIC travel torch is for cutting, gouging, beveling or grooving of ferrous and non-ferrous metals. Model "L-3" utilizes electric arc and compressed air. It is said to be particularly suited for long gouges, cuts or bevels and where there are no intricate configurations.

Model is held and moved by a machine on a track. For circumferential seams work is rotated. Speed travel can be predetermined and set at constant rate. Operator feeds electrode into work by racking cylindrical electrode holder as the electrode is consumed. Torch can hold electrodes to $\frac{3}{8}$-in. diameter. Model "L-5" is for electrodes to $\frac{5}{8}$-in. diameter. *Arcair Co.*

Circle No. 7.

Head manipulator

AUTOMATIC welding head manipulator will make its public debut at the American Welding Society show in Buffalo, N. Y., this month.. The "Universal" manipulator was developed for fabrication of large weldments.

Features of the "Universal" include portability, three-directional travel, electrical controls, welding speeds to 72 ipm, 360-deg boom rotation and adjustable track. *Lewis Welding & Engineering Corp.*

Circle No. 8.

Automatic welder

SPECIAL stake welder is modification of standard model "A" stake welder. This machine is designed for automatic arc welding of flat stock.

Machine includes side loading platforms with ball transfer rolls as aid in material handling. Positive clamping, accurate gaging, water-cooled copper back-up bar are features. Welder can handle flat stock of all types to $\frac{1}{4}$-in. thickness, states manfacturer. *Morton Mfg. Co.*

Circle No. 9.

Hardness tester

PORTABLE metal hardness tester provides reading corresponding to Rockwell A, B or C scales or Brinell medium or low scales. The tester gives accurate readings quickly on most metals, states manufacturer.

Direct reading is made, without cutting a sample, by placing tester on metal, pressing handgrips down and reading dial. For continuous-run testing a bench adapter is available. *Newage International, Inc.*

Circle No. 10.

Hardfacing powder

HARDFACING powder can be sprayed from variety of guns and can be applied to practically all metals with melting points above 1,350 F, it is claimed. Called "Hi-C," nickel-base-alloy powder gives deposit of high hardness with good wear resistance. Suitable for use in automotive, electrical, farm tool, earthmoving equipment.

Fused surfaces sprayed with "Hi-C" may be hot-forged. Sprayed and fused surface can be ground to mirror-like surface. Available in Rockwell C scale hardnesses of 40, 50 and 60. *Superweld Corp.*

Circle No. 11.

Mercury thyratron

THYRATRON "NL-632B" is a member of the mercury-vapor, shield-grid class. It is designed for use in frequency-changer-type resistance welders.

The "NL-632B" rating is: 5 filament volts; 4.6-amp filament current; 2.5-amp d-c anode; 30-amp peak anode current; 1,500 volts peak inverse and peak forward; maximum averaging time, 15 sec. *National Electronics, Inc.*

Circle No. 12.

Many of these new products will be shown at the AWS show, May 9-11, in Buffalo.

HOW TO GET WELDED SECURITY ON THE MOST CRITICAL JOBS

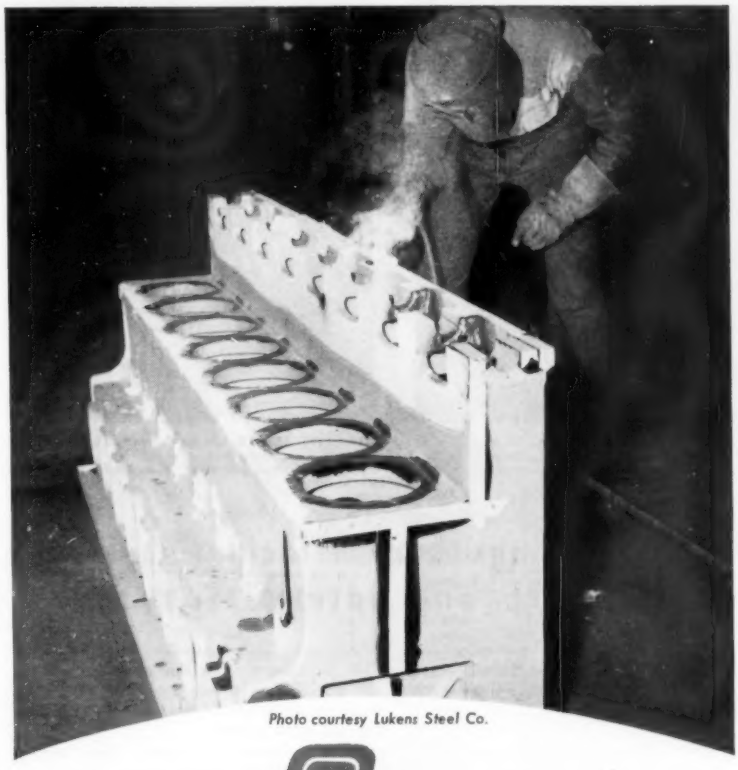
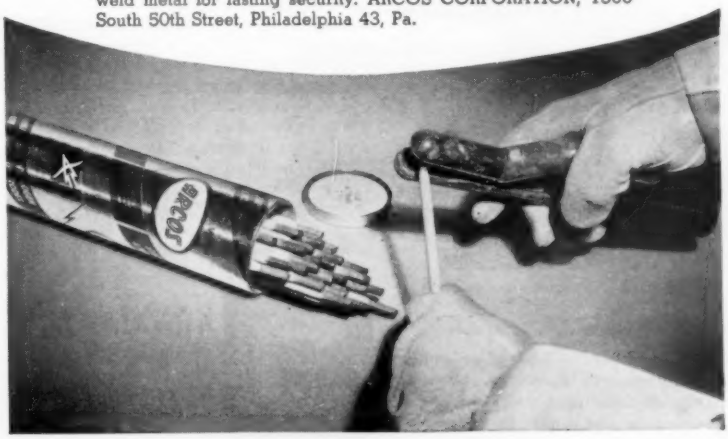


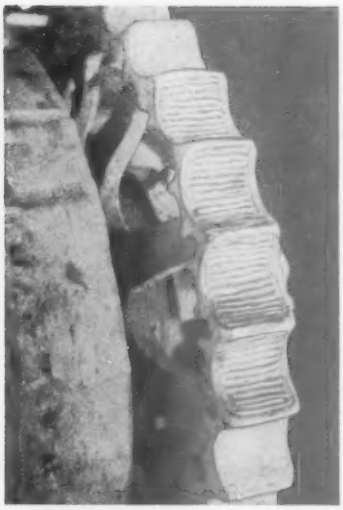
Photo courtesy Lukens Steel Co.

WELD WITH ARCOS

STAINLESS ELECTRODES

This Diesel engine housing—for use on a mine sweeper—is a new application for welded *stainless*. 18-8 stainless was selected for its non-magnetic properties. The unit, and many others, were completely welded with Arcos E308HC-15 low magnetic permeability coated electrodes. Why Arcos? For a reason you'll want to keep in mind: When base metal properties are critical . . . and performance requirements exacting, Arcos quality assures sound weld metal for lasting security. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.





INTERMITTENT PASS used in hardsurfacing sprocket reduces rebuilding time and alleviates grinding by sand and mud.

TRACTOR IDLER shows herring-bone pattern of hardsurfacing created by intermittent pass. Grind and wear is reduced by this method.

Welder develops hardsurfacing shortcut using RANITE and intermittent pass

IN LOOKING for a more economical and quicker way to hardsurface tractor sprockets and idlers, Welding Foreman Art Powell of the L. E. Webb Construction Co., Inc., Santa Maria, Calif., hit on the idea of applying Ranite metallic coated hardsurfacing materials with an intermittent pass. In using this technique Powell lays down alternating beads with a gap between.

After trying other methods, Powell found this combination required less rebuilding time and at the same time effected a substantial dollar saving on each job.

Tractors of the Webb Construction Co. operate in both loose sand and mud with parts subject to continual heavy abrasion. When an intermittent pass is used on sprockets and idlers, resulting gaps formed between beads provide escape channels for the sand and mud, reducing grind and wear on these parts.

ART POWELL, welding foreman for L. E. Webb Construction Co., Inc., long-time Ranite user, combined Ranite with intermittent pass to reduce hardsurfacing time.

Although the Webb Construction Co. has been a Ranite user for more than two years, this is the first time Ranite was used for tractor maintenance and applied with an intermittent pass. Both Ranite "A" 3/16 and "B" 3/16 are being used for this purpose. Ranite was selected for its fast deposition rate, its resulting smooth weld bead and because it will not work harden.

Prior to shifting to Ranite, rollers were either sent out for rebuilding by automatic or were replaced with new ones. Actual savings now produced by using Ranite over automatic is $6 per roller with savings on sprockets and idlers totalling more than half previous costs. In addition, Webb Construction Co. has reduced actual hardsurfacing time by 50 per cent with the Ranite and intermittent pass combination.

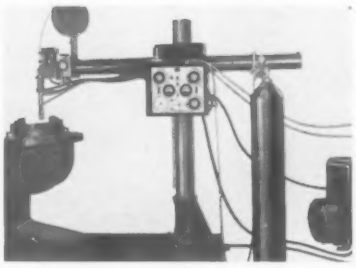
Original parts used by them have a normal life expectancy of between 2000 and 3000 hours. Indications of Ranite hardsurfaced parts checked at 1000 hours of use are that the service span will be increased as much as three times.

Ranite, manufactured by Rankin Manufacturing Co., is the original metallic coated hardsurfacing rod in use throughout industry since 1938. It is made in several grades with a rod available to fit any hardsurfacing job. Toughness in proper relation to hardness is the answer to any wear problem and Ranite is alloyed on this principle with each grade being proportioned to give maximum wear for the job it is designed to do.

Cut your hardsurfacing time and costs now by shifting to Ranite. There's a Ranite rod for your particular application. For further information see your Ranite distributor or write to

Ranite
HARDSURFACING
WELDING MATERIALS

RANKIN
MANUFACTURING CO.
DEPT. E-1
616 SO. MARENGO AVE.
ALHAMBRA 2, CALIF.



Mig welding unit

AUTOMATIC Mig (metal inert-gas) welding unit is for use with constant voltage "Powromatic" welder. Unit can be mounted on a stationary fixture with work traveling, or on a traveling fixture with work stationary.

The models available are "AIG-4D," a dual control type with double swing welding head, gas and water supply facilities, dual control panel, wire reel and spool adapter. The "AIG-4T" is triple control. It has same components as other model but adds additional travel motor speed control in control panel. Argon, helium or carbon dioxide may be used as shielding gas. *Hobart Bros. Co.*

Circle No. 13.

Weldor's goggles

SAFETY goggle is fog-free cup-type goggle. Termed "No. 421," goggle has ventilator which is perforated and plated. This is said to give abundant ventilation. It is permanently riveted to the cup.

Ventilator is shaped to catch and trap circulation of air, regardless of direction of flow, giving five-way circulation. Movement of air reduces possibility of fogging. *Sellstrom Mfg. Co.*

Circle No. 14.

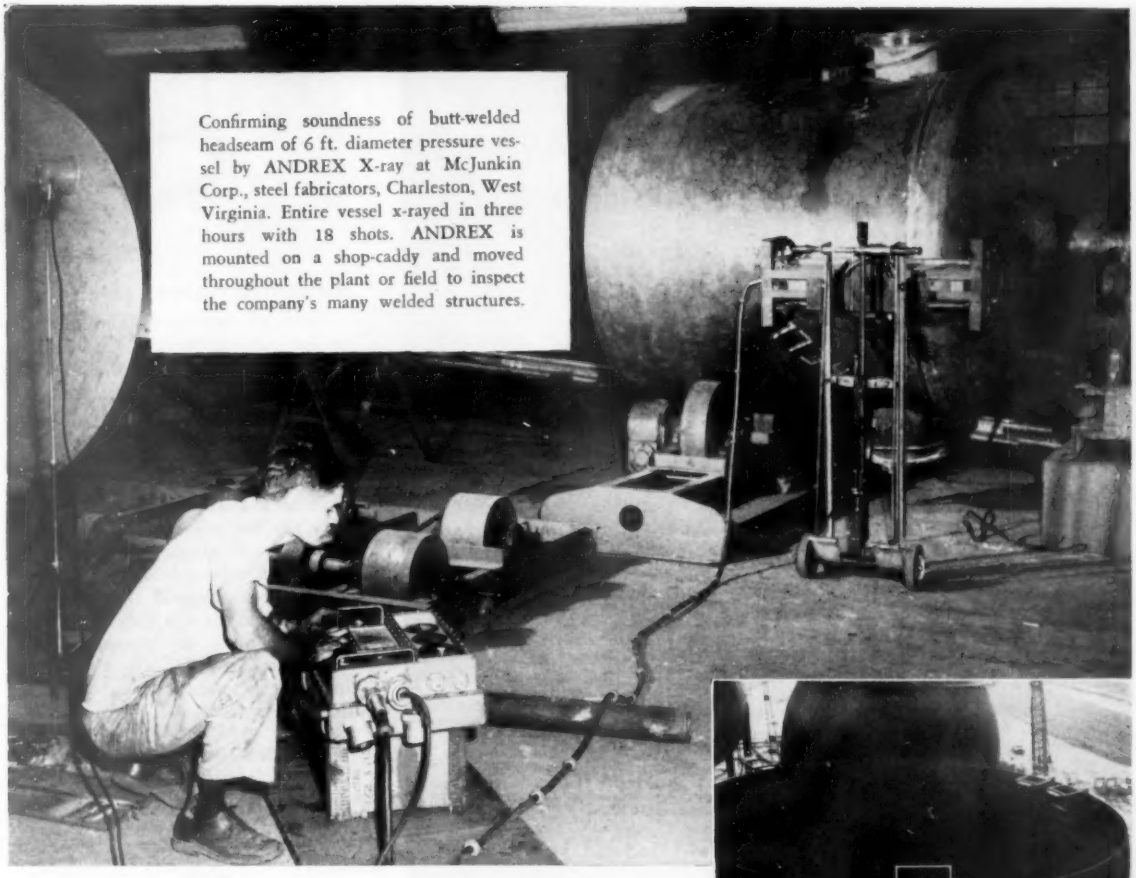
Radiation monitor

WRIST badge holder with sensitive film is for protection against overexposure to radiation. A film badge service is maintained. One badge holder for each person to be monitored and a month's supply of film badges are supplied. Fresh badges are shipped when needed.

The badges, numbered individually, are placed inside holder and worn for one week. Used badges are then returned to supplier for analysis.

Badge holders are supplied with twin clip attachment as well as the wrist band type. Wrist-band type recommended when handling radioisotopes or wherever hands are closest to radiation. *St. John X-ray Laboratory.*

Circle No. 15.



Confirming soundness of butt-welded headseam of 6 ft. diameter pressure vessel by ANDREX X-ray at McJunkin Corp., steel fabricators, Charleston, West Virginia. Entire vessel x-rayed in three hours with 18 shots. ANDREX is mounted on a shop-caddy and moved throughout the plant or field to inspect the company's many welded structures.

ANDREX PORTABLE X-RAY

non-destructive inspection of welded metal structures . . . fast, thorough, economical

X-ray, the preferred method of controlling weld quality, can be applied to plant and field work with the truly portable ANDREX unit. It is a compact unit consisting of a simple-to-operate control panel and an X-ray head that can be quickly and easily positioned anywhere. It provides a film record which either confirms the soundness of the weld or shows up both the nature and location of any hidden defect. Penetrating power is ample for practically all structures. Already in widespread use throughout the world, ANDREX is thoroughly dependable with over 2½ years of maintenance-free service being commonplace.

Write for further information on ANDREX X-RAY

•

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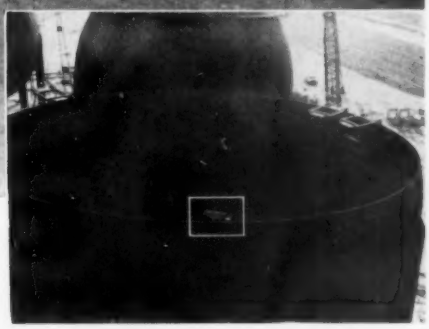
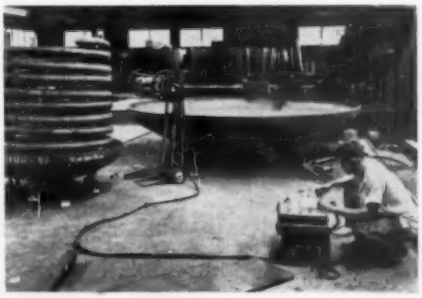
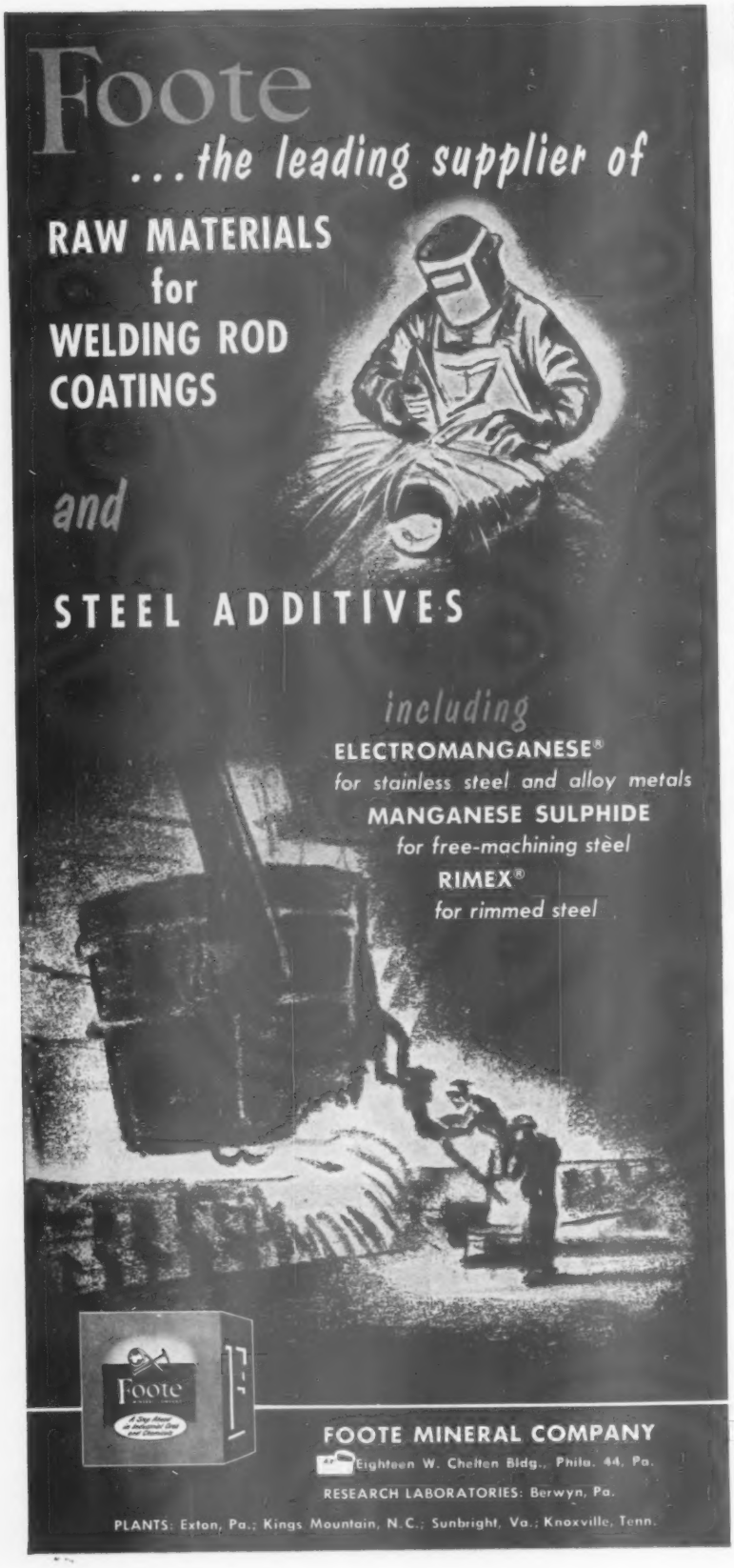
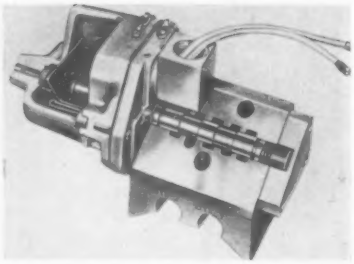


Maintaining quality control with 17,971 ANDREX X-ray pictures during construction of Hortonspheres for Calumet Nitrogen Products Co. by Chicago Bridge and Iron Co. 2000 to 2500 pictures per week taken at night so as not to interfere with work. ANDREX is mounted inside sphere and areas are traversed by turning machine slightly for successive pictures. As all pictures are taken under same condition, quality is constant.



ANDREX, in a setup similar to this one at McJunkin Corp., examines internal stainless steel coils for pressure vessels at Texas Pipe Bending Co., Houston, Tex.





Pressure valve

COMPACT lightweight aluminum valve is for air, oil pressure applications. It is easily adapted to welding guns and pedestal welders. The "Comet II" is a spool type. Valve cycle is within 0.033 seconds, has hard working surfaces and is built to tolerances of 0.0001 in.

It is available with ¼ or ⅜-in. pipe tap for inline manifold or base mounted; in single solenoid spring return, double solenoid momentary and double solenoid three position. Can be used for straightway or three-way functions by plugging ports. Valve measures 7¼ by 3½ by 3⅞ in. Flow capacity is equal to ¼ in.-diameter hole. *Ross Operating Valve Co.*

Circle No. 16.

Arc welders

EXPANDED line of "Sureweld" arc welders, numbers 10 different types and 93 models, including a-c welders, d-c rectifier welders, a-c inert-arc welders, combination a-c/d-c welders and portable engine-driven d-c welders.

The d-c rectifer includes four different types: "DRCV" series for inert-gas, metal-arc welding; "DRGA" for maximum crater elimination; "DRH" series, a welder with new horizontal styling and single current range; the standard, general purpose d-c rectifier type.

Portable "SGW" welder is air-cooled engine-driven d-c unit. It is rated at 200 amp, 30 volts, d-c, 50% duty cycle, will handle 3/16-in. diameter electrode. Also has 1,500 watt a-c power takeoff. Three new welders are inert-arc type: "ACGA-220" series, with mechanical current control, in ranges of 140, 200, 300 amp; "ACGA-250" series with electrical current control, in 150, 235, 350-amp models; "GAMA" series, with electric current control, equipped for a-c/d-c metal-arc welding and inert-arc welding.

Industrial a-c welder, "ACHD" series, is available in five models with 60% duty cycle at 200, 300, 400, 500 and 600 amp. *National Cylinder Gas.*

Circle No. 17.

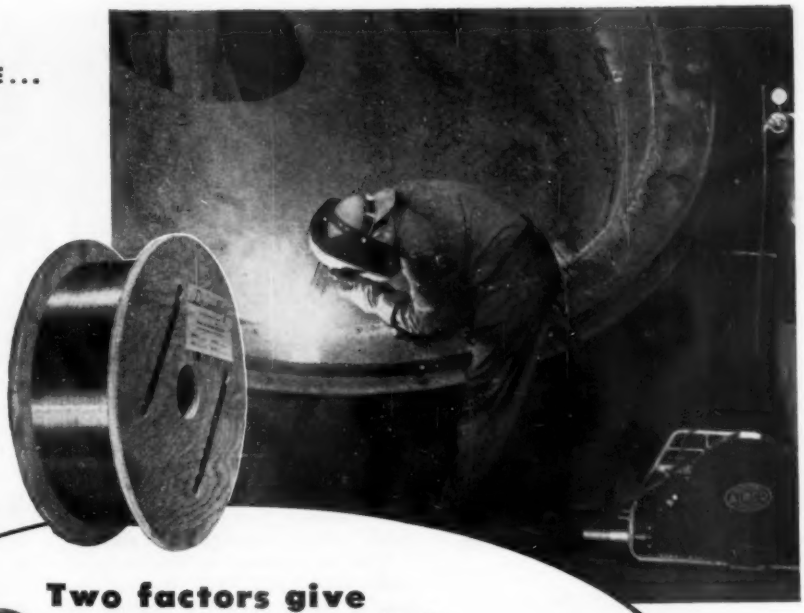
STAINLESS STEEL WELDING WIRE...

Spooled... layer wound to assure a smooth, even feed. Sizes: .035", .045", 1/16", 5/64" and 3/32" diameters.

Coiled... layer wound on rims for submerged arc welding. Sizes: 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.

Cut Lengths... straightened and cut wire furnished in 36" lengths for inert arc and gas welding.

Sizes: .035", .045", 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.



Two factors give Drawalloy CORPORATION WELDING WIRE best on-the-job performance

WEAR-O-MATIC HARD-FACING WIRE...

Coiled... precision drawn for perfect roundness to insure continuous, smooth feed with any automatic head. Available in six Types for hard-facing applications.

Drawalloy welding wire is a product of two factors—years of experience in the welding industry combined with the best wire mill drawing practices. The result is clean welding wire with the proper finish, temper, diameter tolerance and chemical analysis. It's a wire that produces the highest quality welds continuously—with an easy, sure feed and a constant, smooth arc.

See your distributor or write Drawalloy Corporation, Lincoln Highway at Alloy Street, York 12, Pennsylvania

Drawalloy

CORPORATION

The Wire Mill For The Welding Industry

YORK, PENNSYLVANIA

Plate clamp

MAGNETIC plate clamp can be used on a variety of welding applications. The clamp has 3,000 lb electro-magnetic pull. It is equipped with a ratchet lever jack. Its heavy duty power is said to be sufficient to straighten warped sheet steel. Ratchet operated jack can be used for plate alignment.

Unit has a portable carrying handle, which can be replaced with lift hook. *Portomag, Inc.*

Circle No. 18.

Belt grinder

ABRASIVE belt applications found in grinding, polishing or deburring can be performed on "DBA-1F Flex-A-Belt" machine. Designed for industrial use, multipurpose unit has rugged construction, totally enclosed motor, automatic spring load belt tensioning and positive belt tracking.

Extension arm assembly can be rotated 360 deg. Unit has direct contact wheel with fast interchange from platen to formed belt grinding. Work rest is located on each spindle. "DBA-1F" is available in three types. *Curtis Machine Corp.*

Circle No. 19.

Filler wire

FILLER wire rod enables weldor to lay sound, high quality bead, it is said. Welds are claimed to have corrosion resistance and strength equal to base metal. The "65 Ni-o-nel" filler wire makes it possible to weld "Ni-o-nel," nickel-iron-chromium alloy.

Wire is produced in diameters of 0.035, 0.045 and 0.062 in., on disposable spools for Mig welding. It is produced in 36-in. straightened and cut lengths for tungsten-arc process, available in 5 diameters: 3/16, 5/32, 1/8, 3/32 and 1/16 in. *The International Nickel Co., Inc.*

Circle No. 20.

Electric motor

LINE of "Linc-Weld" electric motors mark re-entry of manufacturer into electric motor field. Feature of new line is extruded plastic insulation, which is molded into and around stator windings. This is claimed resistant to chemical action, humidity, abrasive dust, lint, oil vapor. It also provides thermal protection.

Motors are available in sizes from 1 to 40 hp. They are built in open type frame and torque design B. Even though built in open-type frame, manufacturer states may be used as splash-motor or as totally enclosed motor in many applications. *The Lincoln Electric Co.*

Circle No. 21.

Warm-up tube

HORIZONTAL deflection amplifier tube is a controlled warm-up type. The "12DQ6" has a 12.6 volt rating at 600-milliamp current, with 11 sec warm-up time.

Also available is a 6-volt version, the "6DQ6." It is rated 6.3 volts and 1.2 amp. Both tubes have extremely high perveance. *General Electric Co.*

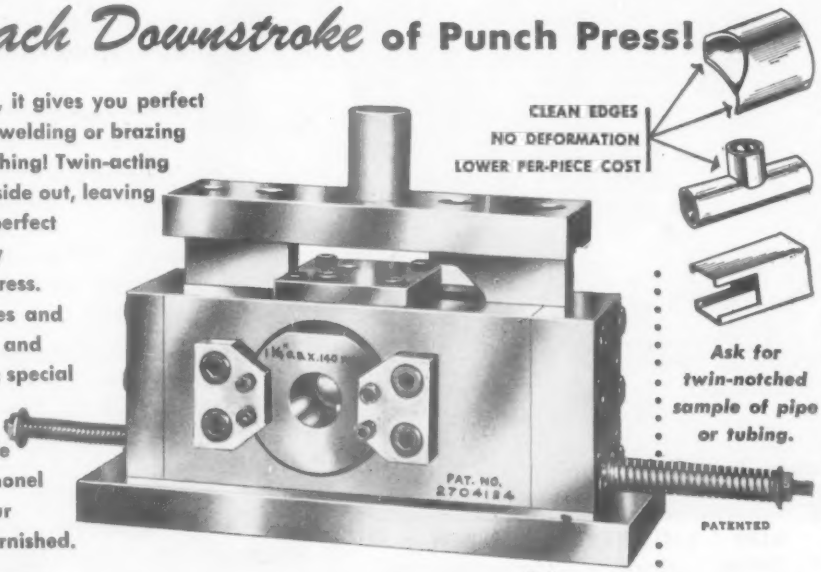
Circle No. 22.

the **ARC-TWIN** *Double Notches* **Pipe and Tubing**

with *Each Downstroke* **of Punch Press!**

SAVING both time and cost, it gives you perfect T-joints—instantly ready for welding or brazing without deformation or finishing! Twin-acting punch shears clean, from inside out, leaving two matching notches (in perfect 180° alignment) with every downstroke of the punch press. Quickly interchangeable dies and punches accommodate pipe and tubing from ½" to 2⅛" O.D.; special units, up to 3" O.D.

Special Arc-Twins for double notching stainless steel or monel metal and units built to your specifications can also be furnished.



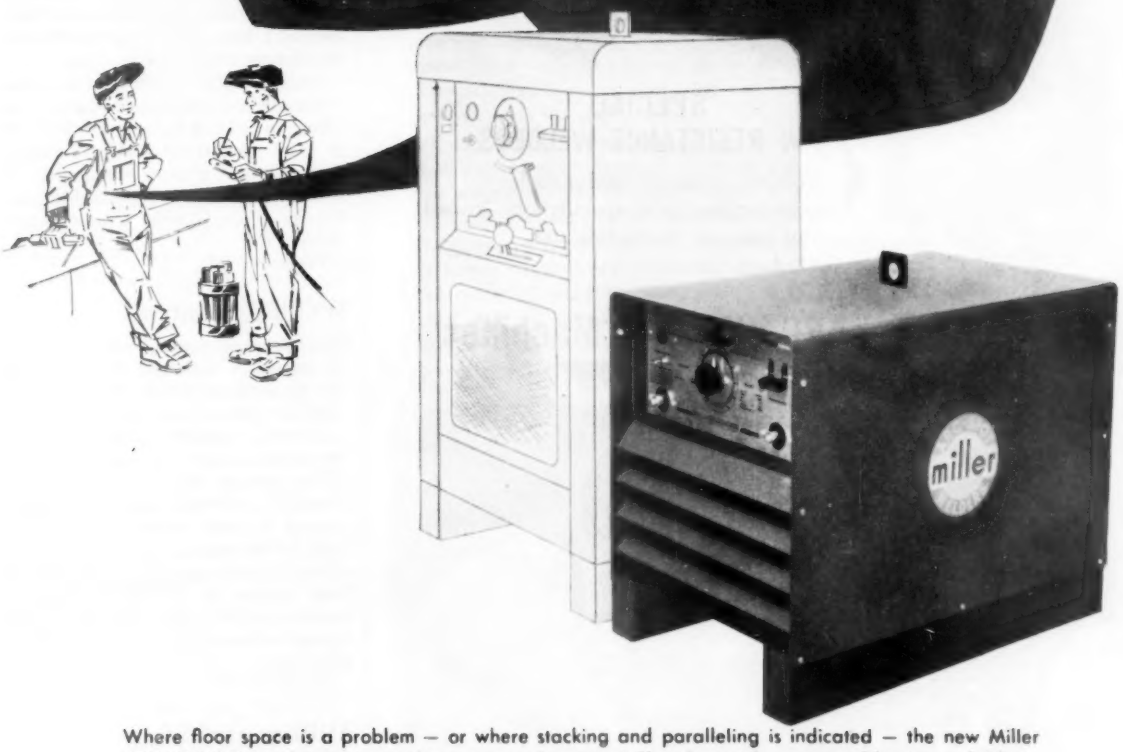
Ask for twin-notched sample of pipe or tubing.

PATENTED

VOGEL TOOL AND DIE CORPORATION

1805 NORTH 32ND AVENUE
MELROSE PARK, ILLINOIS

say, see the new **miller** *SRH low-boy?*



Where floor space is a problem — or where stacking and paralleling is indicated — the new Miller SRH LOWBOY is the engineered-to-your-needs answer! This dc rectifier type welder is available in three models with 60% duty ratings of 200, 300 and 400 amperes. Combining compactness with quiet operation, minimum arc blow, top electrical efficiency and waterproof construction, the LOW-BOY is *another* Miller first that "figures."

Upright SR models to 600 amperes at 40 volts with 750 amperes maximum output; Duplex units up to 1200 amperes, 40 volts, 1500 amperes maximum.

" . . . if it's MILLER you know it's the finest . . . "

New

MILLER ARCWELD welding electrodes are worthy of the MILLER name and reputation. Ask your distributor for some . . . you'll *like* the job they do.

BE SURE TO LOOK US UP
AT THE SHOW IN BUFFALO
BOOTH 266

miller

ELECTRIC MANUFACTURING CO., INC.
APPLETON, WISCONSIN

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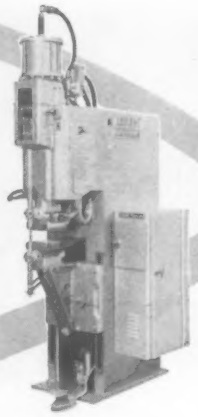
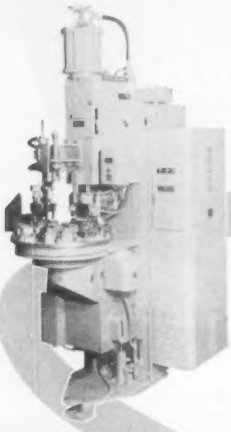
Montreal, P.Q.

STANDARD
T-W RESISTANCE WELDERS

Standard welders (spot, seam, projection or flash-butt) are versatile. Simple tooling changes enable economical production of different jobs.

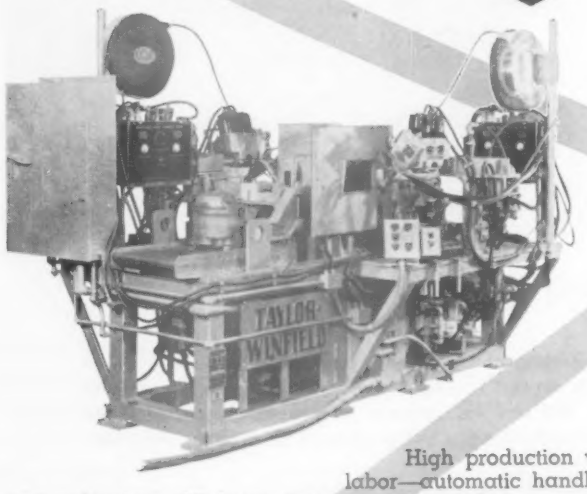




SPECIAL
T-W RESISTANCE WELDERS

Welders specially designed for mass production of specific job—lowest total cost per production unit.

and Special ARC WELDING Machines



High production with minimum labor—automatic handling, clamping and unloading. All latest fusion welding techniques applied to your problems. Above machine automatically handles and hermetically seals refrigeration compressor housings.

The **TAYLOR·WINFIELD** *Corporation*
WARREN, OHIO

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See Us at Booth No. 94
AWS Welding Show—Buffalo

Plastic eyeshield

PROTECTIVE flexible plastic eyeshield is of fog-proof design. Termed "Airflow", it has non-corrosive 20-mesh ventilating screen, 10 in. long.

Unit has full vision sideways and downward; pantascopic angle (lens tilting in toward face) permits greater work area vision, states manufacturer. Optical plastic lens, highly resistant to pitting, is replaceable. Unit weighs 2 oz. *United States Safety Service Co.*

Circle No. 23.

Welding control

HEAT program control timer is for use in resistance welding. It is said to aid in welding metals that are oxidized or those not readily cleaned.

Control supplies current in three successive periods. It conditions metal by burning through coating with increasing current; supplies constant current to weld metal, and anneals weld by decreasing current. Duration of each period may be varied through heat range of 20-100%. Unit is bench-mounted: may be used with variety of welding heads. *Raytheon Mfg. Co.*

Circle No. 24.

Milling carbide

CARBIDE is for milling high-tensile cast irons. Use of grade "860" is claimed to provide strong cutting edge resistant to chip-outs or cratering. It is said to be adapted for milling newer types of gray cast irons in higher hardnesses of 223 to 248 Brinell. *Carboloy Department.*

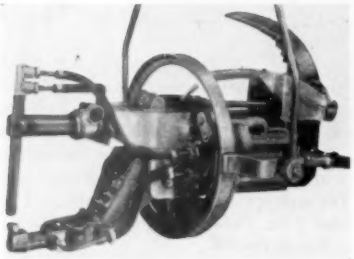
Circle No. 25.

Mist collector

DESIGNED for industrial application, line of "Mistkop" mist and vapor collectors has been expanded. Totalling four units, they range in capacity from 614 to 3,600 cfm.

Collectors are non-electronic type, employing compressed filter of fiberglass as condensing element. Collectors are for machining or grinding where liquid coolant produces mist or vapor. *Aget Mfg. Co.*

Circle No. 26.



Portable spot welder

SPOT welder is portable. Called "Model P-293-A," welder has one-hand operation, adjustable spring pressure, trip switch or timer (according to model). Welder has 360-deg movement, gyroscopic suspension. *ARO Spot Welder Div.*

Circle No. 27.

Iron-powder electrode

ELECTRODE "Rocket 14" is designed for a-c or d-c operation in all positions. Iron powder in the coating permits welding at higher currents, states manufacturer.

The arc is said to be soft and stable in all positions. Contour of weld is controlled by arc length—short arc increasing and long arc decreasing convexity. Electrode comes in number of sizes, packed in 50-lb packages; a 3/32-in. size in 25-lb packages. *Hobart Bros. Co.*

Circle No. 28.

Control thyratron

THYRATRON has three different base connections. The three types of this 6.4 amp negative control thyratron incorporate element and envelope construction. This provides maximum cooling.

The "GL-6807" has pin-type base and can be used interchangeably with the "GL-5545." The "GL-6808" has flexible "flying" leads; "GL-6809" has spade lug terminals extending from the base. High commutation factor ratings suit these models to motor control and other inductive load circuits without cushioning. New thyratron supersedes "GL-5545." *General Electric Co.*

Circle No. 29.

Machining, cutting

SINTERED aluminum oxide "Ceralox OX-12" is cutting tool material for use in metalworking. It is said to be extremely hard and resistant to cratering. Tool holder "Dex-A-Tool" can accommodate wide range of throw-away cutting inserts, including the "Ceralox" cutting tips. *Adamas Carbide Corp.*

Circle No. 30.

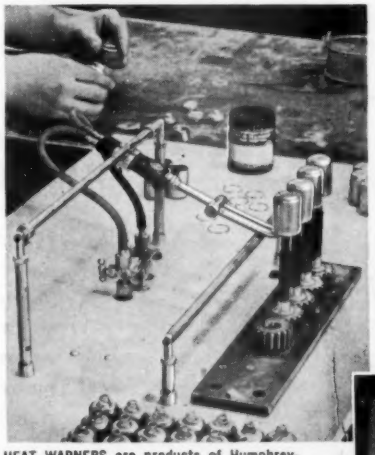
...EASY-FLO HELPS PUT DEPENDABILITY IN THIS "HEAT WARNER"

This simple safety device is used on railroad bearing boxes and all kinds of machines and equipment to give warning when temperature rises to a danger point. It comes filled with an odorous gas or with smoke, under pressure, held in by an alloy plug that has a fusing temperature to fit the application.

It's made of a drawn brass shell and a brass screw machine made cap, brazed with EASY-FLO 45. This low-temperature silver brazing alloy is used because – *it naturally and consistently makes gas-tight joints* that have the properties to stay gas-tight permanently–namely–high strength with resistance to pressure, vibration, shocks, heat changes and corrosion equal to the metals joined. In addition, EASY-FLO 45 makes brazing an extremely simple, economical operation.

EASY-FLO 45 RING

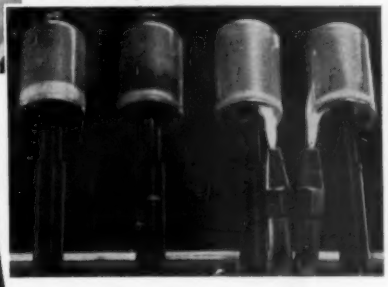
HOW'S THIS FOR FAST, EASY METAL JOINING



HEAT WARNERS are products of Humphrey-Wilkinson, Inc. Chemical Manufacturers of North Haven, Conn. Equipment by Specialty Brazing Laboratory, Riverside, Conn.

Above are the parts with ring of EASY-FLO 45 wire in place. At left —Operator applies HANDY FLUX*, puts shells over alloy ring and cap, sets assemblies, cap down, on geared spindles. Below—2 assemblies are brazed at a time on the slowly revolving spindles with double-tip torch — heating time, 12 seconds.

*Working at 1100°F, HANDY FLUX is a "must" to get full benefit of EASY-FLO 45's low flow point of 1145°F. Besides, it is unsurpassed as a dissolver and absorber of refractory oxides.



WELDING SHOW

BUFFALO, N. Y.-MAY 9-11

SEE a production brazing job in actual operation. Also many other examples of EASY-FLO brazed parts. TALK to our engineers about your brazing problems. BOOTH 39

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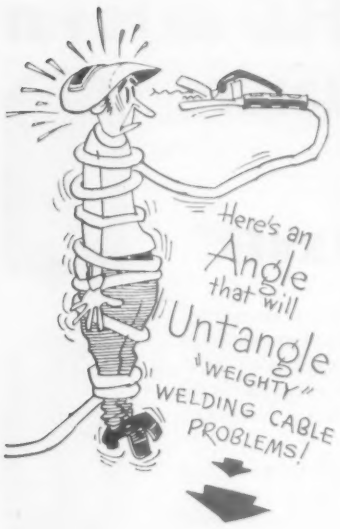

***TWECO-LITE**

*the new flexible ALUMINUM welding cable that weighs half as much, lasts longer, costs less

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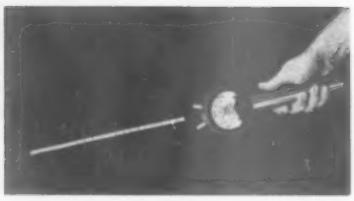
Wichita 1, Kansas



Pyrometer

LIGHT and portable, hand-held pyrometer is probe type. It is for use in all types of non-corrosive metallic and non-metallic liquids, in atmospheres of furnaces, kilns, ovens and other high-heat containers.

Termed "Model 321," pyrometer has a built-in calibrating thermometer, positioned in the immediate vicinity of the cold junction. Probe is 19 in. long, available in two types. Thermocouples are refractory bead insulated. *Pacific Transducer Corp.*

Circle No. 31.

Plastic plug valve

PLUG valve is injection-molded of polyvinyl chloride. It is designed to handle corrosive fluids. New valve is claimed to minimize purging and eliminate contamination problems experienced when certain fluids encounter metallic components of piping systems.

Teflon bearing buttons on plug give self-lubrication. Straight-through port gives unimpeded flow. Nub on button can be tapped for insertion of drain plug. Valve can be furnished with threaded ends or socket type end for solvent welding. Sizes are 1, 1½ and 2 in. *Tube Turns Plastics, Inc.*

Circle No. 32.

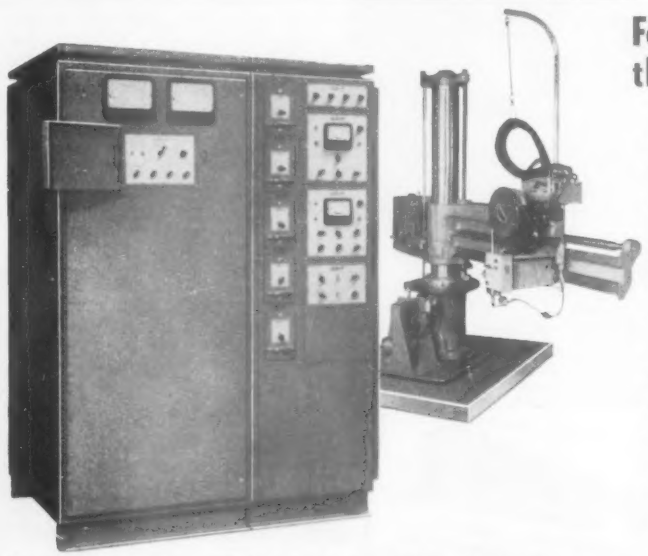
Arc welder

IMPROVED selenium rectifier is feature of d-c "Bumblebee" arc welder. Rectifier was designed especially, it is said, for converting a-c to d-c. Welder features single range of current adjustment.

Low design permits tacking for parallel operations. Other features are weatherproof construction for outdoor use; instantaneous voltage recovery; forced draft ventilation. Single-range arc welder is available in 200, 300 and 400-amp models. *Air Reduction Sales Co.*

Circle No. 33.

Many of these new products will be shown at the AWS show, May 9-11, in Buffalo.



Features Exclusive Slope Control that Boosts Production 200%

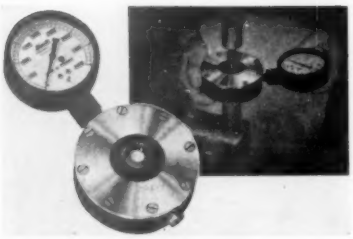
Provides 3-cycle slope at arc initiation and cut-off (a six-time improvement over previous 18-cycle slopes) that has boosted heliarc welding production 200% on a variety of jet engine parts. Eliminates burning at start and stop; permits instantaneous switch-over to different thicknesses. Features a power source, current control and slope control all packaged in one integral unit. To this is added the specialized electronic control (designed to your job) for precise torch head control in three planes. See it in action or write for brochure.

New Inert Gas Shielded Arc Welding Control

YOUR SOLUTION TO WELDING CONTROL AT BOOTH 117
AWS WELDING SHOW – MAY 9-11 BUFFALO, NEW YORK

Come in and work out your problems with the Welduction application engineer. See units in actual operation. Qualified control engineers will be on hand full time to help you.

Welduction Corp.
10230 Capital Ave. - Oak Park, (Detroit) Mich.



Force gage

HYDRAULIC force gage is designed to measure force between electrodes on spot welding machines or between rolls on roll welders. A direct reading gage, it can be used in compressive tests and in forming, dimpling and upsetting.

The unit has insulated contact surface, preventing damage from accidental firing of welding equipment while measuring. Use of gage is claimed to enable duplication of correct electrode pressure without numerous sample welds. Gage is available in five ranges: 0-1,000, 0-6,000 0-10,000, 0-20,000 and 0-40,000 lb. It is 3½ in., 8½ lb. net weight. *Webster Instrument, Inc.*

Circle No. 34.

Flame-cutting machine

MACHINE is designed for straight cut-off and beveling operation on medium and large diameter bar stock and pipe. For pipe cut-off, oxygen cutting torch is mounted radially, describing complete revolution around work. Bar stock cutting utilizes "secant" action.

Built-in safety limit switches stop rotation of torch head at cut completion. Pressure piping can be beveled by mounting torch in adjustable angle clamp at desired bevel angle. Torch head is driven through variable speed drive mechanism. *Speedi-Burn Products Co., Inc.*

Circle No. 35.

Arc welder

AVAILABLE in 200 and 300-amp models, new "Heliwelder" is for use with the various inert-gas arc welding processes in addition to metal arc welding.

Welder incorporates single-phase transformer, selenium rectifier and stabilizing reactor, permitting the operator to select either a-c or d-c. High frequency, with rheostat control, is built-in and balancing resistor in series with transformer secondary provides correct current for inert-gas welding. Switch converts machine to metal arc welding. *Air Reduction Sales Co.*

Circle No. 36.

GB Silver Brazing Alloys

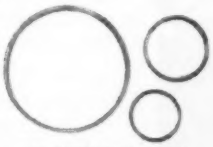
Used in Many Hospitals Where Safety Means Life or Death

Sound, leak-proof joints are a MUST in hospital construction requiring the piping of Oxygen and Anesthetic Gases to wards, rooms and nurseries *for instant use!* That's why leading designers and contractors specify dependable GB Silver Brazing Alloys, Preformed Rings and Fluxes.

GB Preformed Rings, for example, assure stronger, safer everlasting joints. They save time, require less metal, meet all specifications, cost less. Perhaps life or death are not a factor when you do silver brazing, but the dependability, efficiency and economy provided in GB products are good reasons for their choice . . . especially when they cost so little.

. . . Shown above is typical installation of oxygen wall outlet, snap coupler and flow meter. GB Preformed Rings are used to braze (1) wall assembly to screen; (2) tube to regulator; and (3) tube to gauge. For complete data write today.

GB FLUXES are fully active, deep penetrating, stable and economical. Produced under strict laboratory control they are extremely effective in producing high quality joints.



GB PREFORMED SILVER BRAZING RINGS are available in a wide range of sizes for all requirements. They are easy to use, save time and labor, assure lasting results.

GB SILVER BRAZING ALLOYS are made in random coils, strips and many special shapes in addition to preformed rings. Also available is Goldsmith's Technical Service Division cooperation for competent assistance in all brazing problems.

Dealer Distributor Inquiries Invited **Write for GB Data Book**

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Mail Coupon for your FREE copy of the GB Data Book — complete information on low temperature Silver Brazing

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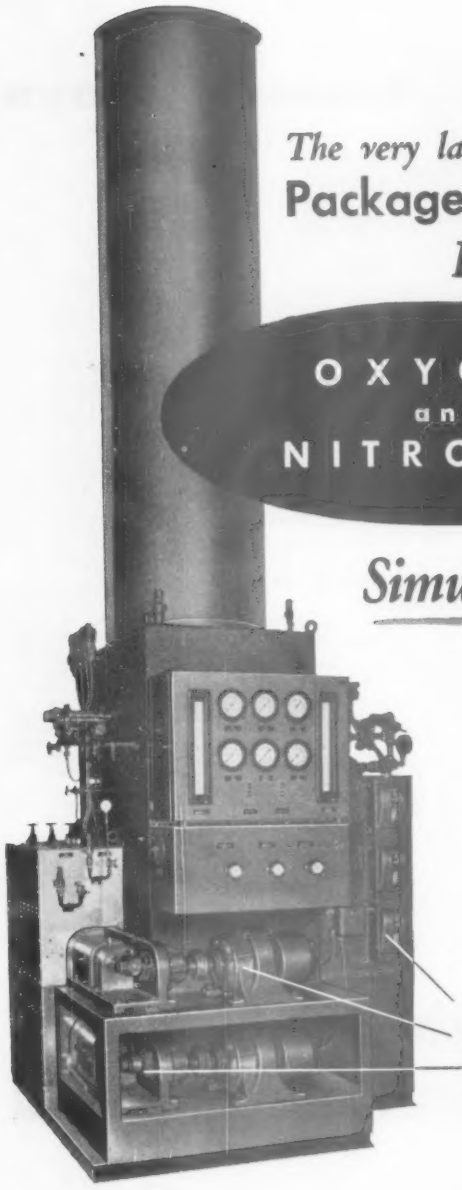
The very latest in
Package Type Plants
Producing

OXYGEN and NITROGEN

Simultaneously



With the introduction of our latest, improved design Package Type Generating Plants, production of high purity Oxygen and Nitrogen simultaneously *increases* production 60% over the production of Oxygen alone, *plus* a corresponding reduction in the *cost* of manufacture. Due to its compact design, a minimum of floor space is required and streamlined panel assembly insures instant visibility of all control gauges. Stock sizes from 1500 to 10,000 cu. ft. per hour. Larger and smaller sizes available. 99.99% Argon available on large size plants.

We invite your inquiry.

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Manufacturers of
CONSULTING · DESIGNING · RESEARCH
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN
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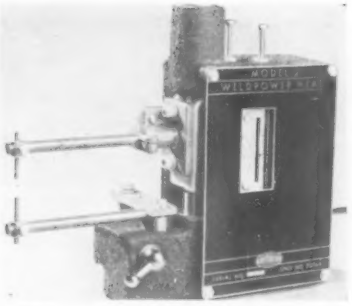


Welding head

PRODUCTION welding head is for use with a-c (to 1.5 kva) or d-c (to 60 watt-seconds) power supplies. Model "J" can weld miniature and subminiature parts such as used in transistors, thermocouples, etc.

Unit is foot-treadle operated. It is claimed to provide high visibility of work pieces; gives fast electrode follow-up. *Raytheon Mfg. Co.*

Circle No. 37.

Grinder

AIR grinder is designed for foundries and other metalworking operations. Termed model "5v," grinder has one-piece housing and newly developed air motor. Grip handles are 110 deg. apart.

Unit is available in speeds of 4,500, 6,000 and 8,000 rpm. Grinder has adjustable, positive-speed governor. Accessories can convert tool from vertical cup grinder to sander, wire brush machine or disc-wheel cut-off grinder. *Thor Power Tool Co.*

Circle No. 38.

Induction heating

LONGER lasting linings for electric high-frequency induction-heating furnaces is said to be provided by new ramming mix. Called "Alumag," mix contains high percentage of fused magnesia and fused alumina.

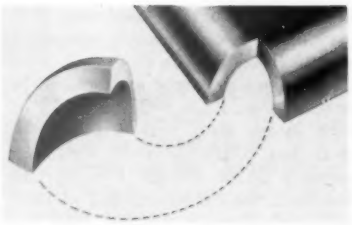
Material is available in several types each having varying magnesia contents and grain-sized for different applications. *Electro Refractories & Abrasives Corp.*

Circle No. 39.

Plastic cement

SOLVENT cement is for joining polyvinyl chloride pipe fittings and flanges. Application is by ordinary paint brush. Use of cement permits solvent welding of polyvinyl chloride piping. Cement joint can be handled in an hour and reaches working strength in 48 hours, it is said. *Tube Turns Plastics, Inc.*

Circle No. 40.



Weldment corners

PREFABRICATED corners for weldments are spherical in shape. They are for use in weldments requiring "ball" corners. They are claimed easily welded into place on weldments having round edges.

To install, notch and bend four edges of the plate and weld corners into place. Available in metal thicknesses and from ⅛ to ½ in. *Conner Steel Products.*

Circle No. 41.

Magnetic amplifier

VARIABLE magnetic amplifier power supply is termed "EM-117." Unit is said to have no moving parts, no filaments and require little maintenance. Unit is said to have high overload capacity.

Amplifier utilizes input voltage of 105-125 volts a-c, 55-65 cycles, single phase; produces continuously variable output of 2-300 volts d-c, 0-5 amp with regulation of 1% or better. Unit has easy-to-read 4-in. voltmeter and ammeter. Available 22 in. wide by 18 in. deep by 48 in. high; other sizes upon request. *Engineered Magnetics.*

Circle No. 42.

Surface grinder

DOUBLE column surface grinding machine is for use in small and medium metalworking shops. Machine has interchangeable 8 in. grinding wheel for rough and fine work. Double column is said to give grinding accuracy and eliminate wear during vertical movement of grinding arm.

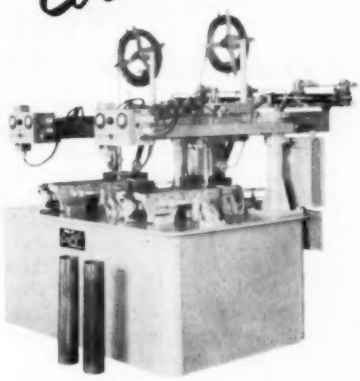
Hand wheel raises or lowers grinding arm. Micrometer scale gives readings to 0.008 in. For horizontal movement, tapered adjustable roller bearings enable outer column to revolve around stationary inner column. A 1½-hp, a-c motor powers unit. Machine is manufactured in Holland by Unicum Inc. *Netherlands Trade Commission.*

Circle No. 43.

Many of these new products will be shown at the AWS show, May 9-11, in Buffalo.

Look to Cayuga for

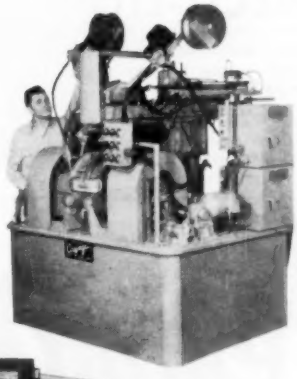
COMPLETE PRECISION WELD-A-MATION



In addition to a complete line of standard High Speed Precision Welding Equipment, the maker of Cayugamatics also designs and builds special welding equipment to fit all your welding requirements.

106 mm Cartridge Welder (above), one of a battery developed and built especially for high speed precision welding.

Aluminum Heat Exchanger Welder (*right*), one of several developed and built for high speed automotive production.



Ultra High Speed Automatic Welder (*left*), with welding speeds from 6 inches to 6,000 inches per minute and stepless control over entire range.

Booth 50-51
WELDING SHOW

- HORN JIGS
- PEDESTALS
- TRAVEL CARRIAGES
- POSITIONERS
- TURNING ROLLS
- BEAMS
- TURN TABLES
- CUSTOM WELDERS
- SEAMERS

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MACHINE & FABRICATING CO., INC.
Depew - Buffalo, New York

TWECO-LITE

— the new flexible ALUMINUM welding cable that weighs half as much, lasts longer and costs less

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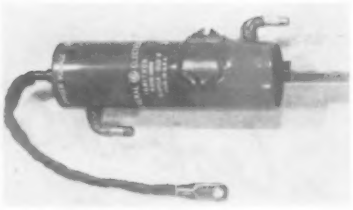


Coated ignitron

PLASTIC coated ignitron provides protection against hazardous voltages. It is said to reduce moisture-condensation on tube exterior. Plastic coating is applied on types "GL-5551-A," "GL-5552-A," and "GL-5553-B" (sizes B, C, and D, respectively).

The coating consists of thickness of 0.050 in. of polyvinyl chloride. All plastic-coated ignitrons are red, with "danger-voltage" stamped on each tube. *General Electric Co.*

Circle No. 44.

Plastic cylinders

CORROSIVE and radioactive materials can be safely handled through use of king-size cylinders. Made of seamless cast polyethylene tubing, containers can be decontaminated with 99% cleanliness in one cleaning operation, manufacturer claims.

Cylinders are light and said to be unbreakable. Each cylinder is 48 in. long in the shell, with 4¾ in. OD; shell has 3/16 in. wall. Cylinders measure 53 in. overall. Polyethylene bottom is welded to one end of tube, with polyethylene molded cone top with threaded pouring spout welded to other end. Pouring spout has leakproof screw-type closure. *American Agile Corp.*

Circle No. 45.

Exhauster

ALUMINUM roof exhauster is for industrial ventilation. Design is functional; low silhouette is space-saving and convenient to install, it is said.

All joints are welded. Light weight enables easy installation of "Aluma-Lung." Unit is leakproof, with dampers open or closed, states manufacturer. Unit is 21 in. overall height; capacities from 3,800 to 42,000 cfm, sizes from 20 to 60 in. *Iron Lung Ventilator Co.*

Circle No. 46.

Tempilstik° FOR ALL HEAT-DEPENDENT OPERATIONS

looks like a crayon... marks like a crayon... tells temperatures like a precision instrument!

Sixty-three different compositions enable you to determine and control working temperatures from 113° to 2000° F.

TEMPILSTIK° marks on workpiece "say when" by melting at stated temperatures — plus or minus 1%.

ALSO AVAILABLE IN LIQUID AND PELLET FORM . . . WRITE "WELDING SALES" DEPT. FOR SAMPLE TEMPIL° PELLETS . . . STATE TEMPERATURES OF INTEREST—PLEASE!

Available in these Temperatures (F.)

113	375	1000
125	388	1050
138	400	1100
150	413	1150
163	425	1200
175	438	1250
188	450	1300
200	463	1350
213	475	1400
225	488	1450
238	500	1500
250	550	1550
263	600	1600
275	650	1650
288	700	1700
300	750	1750
313	800	1800
325	850	1850
338	900	1900
350	950	1950
363		2000

Visit us at Booth 207 — May 9-11
Welding Show — Buffalo, N. Y.

Tempil° CORPORATION 132 WEST 22ND STREET, NEW YORK 11, N. Y.

Visit us at Booth 207—May 9-11—Welding Show—Buffalo, N. Y.

NEWS . . . . . *from page 6*

24, and 25 at Bluefield, W. Va. Better known as the Bluefield Coal Show, the event is sponsored by the Pocahontas Electrical & Mechanical Institute and various Bluefield mine and mill supply houses.

A record attendance is predicted for this year; more than 325 different firms and manufacturers will be represented. Several welding electrode and equipment manufacturers will be among the exhibitors.

Primary purpose of the show is to provide exchange of new processes and equipment between manufacturers and the mining industry.

B & W to build atomic reactor

The Babcock & Wilcox Co., New York City, will build and install a "swimming pool" atomic research reactor for Brazil's Comissao de Energia Atomica, the Brazilian equivalent of the U. S. Atomic Energy Commission. The reactor is said to be the first of this type ordered from a U. S. manufacturer by a Latin American nation.

U. S. Industries acquires two firms

U. S. Industries, Inc., New York City, has acquired the assets of General Farm Equipment Co., San Juan, Puerto Rico, and A-1 Bit & Tool Co., Houston. The acquisitions are another step in U. S. Industries' expansion and diversification program.

General Farm Equipment Co. is a large industrial and agricultural equipment and machinery dealer. It functions as a sales and service agency for many American and European manufacturers.

A-1 Bit manufactures special tools and valves used in drilling and testing of oil wells. It will retain its name but will be operated as a branch of Garrett Oil Tools, Inc., a division of U. S. Industries.

Thor Power Tool moves office

Executive administration offices of Thor Power Tool Co., Aurora, Ill., will move to the new Prudential Building, Chicago, late this year. The transfer will involve executives of management and sales groups, and division managers in sales and sales promotion.

Present executive offices at the company's Aurora headquarters will be retained to supervise principal administrative departments.

DO A MILLION DIFFERENT JOBS *BETTER*

with

UNIQUE • EASIER • FASTER • MORE ECONOMICALLY

POSITIONING EQUIPMENT

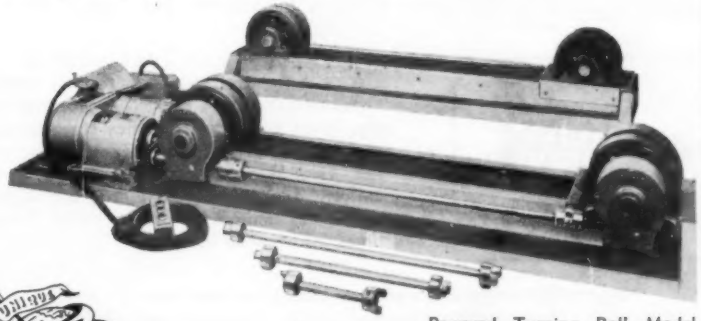
Positioner
Model UPC-140
14,000 lb. capacity

UNIQUE POSITIONERS

- NO BACKLASH when **NEW**—none when **OLD!**
- Designed for MAXIMUM SAFETY and OVERLOAD Protection. Capacities from 500 lbs. to 60,000 lbs.

UNIQUE TURNING ROLLS

- PERFECT ROTATION for manual or automatic welding.
- We build equipment to fit ANY AND ALL APPLICATIONS. Capacities from 1500 lbs. to 100 tons.



Powered Turning Roll Model
UTP-10T, 20,000 lb. capacity

See us at Booth 228B
May 9-11—Welding Show—Buffalo, N. Y.

Write for Catalog 54C

UNIQUE EQUIPMENT, INC.
122 Sumpter St.
Brooklyn 33, N. Y.

THIS IS REXARC'S MODEL RP-43 AUTOMATIC WELDER AND POSITIONER

For Rebuilding Rollers, Idlers and Fabrication Welding on all Circular Shapes

If you do custom welding or operate a fleet of crawler-type tractors, shovels or draglines, the Rexarc RP-43 is the machine for you!

BOOTH 227

WELDING SHOW

MAY 9-11

BUFFALO, N. Y.

Here's automatic welding that is *really* automatic. Rexarc's exclusive electrical design gives you high-frequency starting and stabilization of the arc throughout the entire welding procedure. This assures fast, uniform deposit of weld metal, minimizing stress and dilution of parent metal. Saves times and metal, too.

Operation is simple and controlled from one convenient instrument panel. You can do longitudinal welding, too. Arrangement for automatic stepover, spiral or sequence welding is optional.

THE SIGHT FEED GENERATOR CO.

55 East Third Street

West Alexandria, Ohio, U.S.A.

Kacena Co. Welderama attracts 962 persons

A total of 962 persons registered during the two-day Welderama, sponsored by The Kacena Co. to commemorate its 30th year as a distributor. The Cedar Rapids (Iowa) firm also has outlets in Burlington and Clinton, Iowa.

Despite a snowstorm of almost blizzard proportions, 403 persons attended the welding show on the first day—an indication of the effectiveness of publicity the show received in the press and on local radio and television.

Twenty-six manufacturers exhibited during the two-day affair. Door prizes were awarded every half-hour between 3 p.m. and 10 p.m. About 75% of the exhibiting firms conducted live demonstrations. Educational movies were also shown.

Norelco sponsors diffraction schools

The latest in X-ray diffraction will be studied at two schools sponsored by the Instrument Division, North American Philips Co., Inc., Mount Vernon, N. Y.

A week-long series of sessions will be held June 4-8 at the Hotel Morrison, Chicago. San Francisco will be the scene of another series of sessions to meet at the Sir Francis Drake Hotel, Sept. 24-28.

Morning sessions will be devoted to lectures, afternoons will include laboratory demonstrations. Powder camera techniques, X-ray spectrograph, X-ray diffractometer will be discussed.

M & T opens Seattle office

Metal & Thermit Corp., New York City, has established a sales office and warehousing facilities for the products of its welding division at 2739 First Ave., S., in Seattle, Wash.

The new office and warehouse will add to present West Coast facilities. Arthur E. Yeoman will be in charge.

M. W. Kellogg opens regional office

The M. W. Kellogg Co., New York City, has opened a western regional office with headquarters at the Russ Building, San Francisco. William R. Dunn, formerly Pacific Coast manager of the Elliott Co., has been named sales manager of the new office.

Hydraulic Tool forum to be in Detroit

The 1956 Production Machine Tool Hydraulic forum has been scheduled for May 24 and 25. It will be held at the Engineering Society of Detroit building in Detroit. This is the second forum for the machine tool industry sponsored by Vickers, Inc., of that city.

The purpose of the forum is to promote improvements in hydraulic components and systems through open exchange of information. Keynote speaker will be Louis F. Polk, president of the National Machine Tool Builders' Association.

A highlight of the meeting will be a special report by Nevin L. Bean of Ford Motor Co. He will discuss his recent visit to industrial plants in Soviet Russia, giving first-hand observation of Russian machine-tool industry and its use of automation and hydraulics.

GE establishes new laboratory

A materials and processes laboratory with testing facilities has been established at Lynn, Mass., by General Electric Co.'s medium steam turbine, generator and gear department. George A. Ross has been named manager.

AWS members inspect

ALUMINUM manifold assembly occupied interest of this group as 77 members of Kansas City section of the American Welding Society recently toured Fluor Corp. plant at Paola, Kans.

a helping hand means... better rods for you

Welding rods with RUFLUX* in the coating offer worthwhile advantages. What these advantages can mean depends upon which RUFLUX product is used. For RUFLUX is a TAM* trade name which stands for the highest quality Rutiles, Titanates and Zirconium compounds.

A TAM sales engineer can give you the facts quickly and accurately. He is technically trained and is familiar with the properties of the various TAM RUFLUX products. Furthermore, he is supported by a well-equipped and staffed research laboratory offering every available assistance.

This combination offers you a helping hand to better welding rods.

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***TWECO-LITE**

*the new flexible ALUMINUM welding cable that weighs half as much, lasts longer, costs less

Send for free catalog

A Product of
TWECO PRODUCTS COMPANY
Wichita 1, Kansas

Distributor holds welding exhibit

A welderama will be held May 16 and 17 by Mineweld Co. of Indiana, Inc., from 3 until 10 p.m. The exhibit will celebrate Mineweld's 25th year of business. The firm, located at 1339 N. 13th St., Terre Haute, will be host to all who wish to see the latest in welding.

Among the exhibiting firms will be American Manganese Steel Div., The Champion Rivet Co., Haynes Stellite Co., Linde Air Products Co., Miller Electric Mfg. Co., Rankin Mfg. Co., A. O. Smith Corp., Tweco Products Co., United Wire & Supply Corp., and Wiese Plow Welding Co., Inc. Gene Steele is manager of Mineweld.

Future engineers purpose of club

To encourage future engineers, the organization Junior Engineering Training for Schools (JETS) brings first-hand information to high school students. Originated by Michigan State University, East Lansing, in 1950, the program has grown to include 75 clubs in 18 states, with an active membership of more than 2,000 boys and girls.

The clubs provide realistic knowledge of engineering through projects, talks with professional engineers, films and discussions.

Program aims to find engineers

A long-range research program designed to discover high school students of superior ability has been launched by the Engineering Experiment Station of the University of Wisconsin college of engineering, Madison.

The program is designed to discover students of superior ability for engineering and science careers as well as those for professions and liberal arts. (For news of a different program, see editorial, page 31.)

Iowa State host to ASEE meeting

The annual meeting of the American Society for Engineering Education will be held June 25-29 at Iowa State College, Ames.

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I Want LOWER COSTS
I Want EASIER HANDLING
ARO
ARO Model P413-A with Gyro Suspension. Air Hydraulically Operated.
Portable
SPOT WELDERS
* No other machine of its size produces such high welding current
* Easy one-hand operation reduces fatigue . . . enables operator to maintain high production pace
* Easily adjustable spring pressure
* Trip-switch or timer according to model
* Air or water-cooled models
Air-Hydraulic operated gun for high production is also available
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Illustrated Literature on Request
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GUTHERY MACHINE TOOL CORPORATION
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Dealer Inquiries Invited

"See Us At Booth 105 AWS Show, Buffalo, May 9-11"

ASTM holds annual meeting, exhibit

An extensive technical program and apparatus exhibit will provide added stimulus to the 59th annual meeting of the American Society for Testing Materials, Philadelphia. The meeting will be held June 17-22 at Chalfonte-Haddon Hall, Atlantic City, N. J.

A total of 31 sessions are scheduled, with discussion to revolve around research and testing of materials. The latest in research and testing equipment will be exhibited from small hand-manipulated instruments through electronic control devices and high temperature ovens to universal testing machines. New officers will be introduced at the luncheon session June 19.

RW new orders reach new peak

The February report, just compiled, of the Resistance Welder Manufacturers' Association, Philadelphia, reflects a record for new business. New orders reached $6,217,000 eclipsing the record reached in January by 12%. Comparison of new business for the first two months of this year with the same period of last year shows a gain of 154%.

Shipments for the same two months show an increase of 13% over the period of 1955. Backlog of orders on hand at the end of February was approximately $18,800,000 according to the association.

Radiography

—Courtesy The M. W. Kellogg Co.

RADIOGRAPHING huge pressure vessels, to detect possible flaws in welds, is one of assignments of gamma-ray projector. Shown here in use, projector has been positioned on a fork-truck inside the pressure vessel, while film to be exposed by radioactive source is attached to vessel's exterior.

AIRLINE'S "KNOW-HOW" AT YOUR DISPOSAL

THESE TWO FIXTURES CAN GIVE YOU ACCURATE — SMOOTH — PRESSURE TIGHT Fusion Butt Welds

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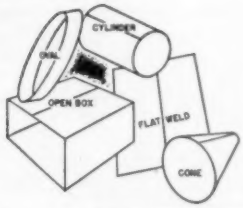

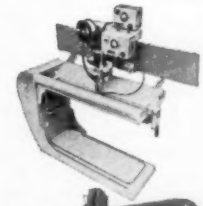

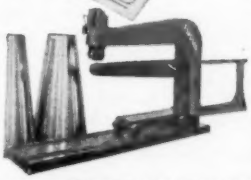

AIRLINE MODEL LW SERIES 1000
Longitudinal Welding Fixture

Manufactured in 2 ft. to 12 ft. lengths. "Toe touch" control permits controlling fingers from any position. Welds sheets, cones, cylinders, boxes, etc., from .010 to one inch thickness. Suitable for MIG, TIG, submerged-arc and hand welds. Available also as complete package.

AIRLINE MODEL R 4000
Planishing Roll—60 Inch Throat

High Roller Face Pressure. Cold works welds and adjacent areas, flattens and smooths fushion welds, increases mechanical properties, reduces grinding. Also flattens flash welds, mash welds, resistance welds and elongated weld areas. Diameters 1¼ in. to 10 ft., and to 10 ft. lengths on large diameters.

WRITE TODAY FOR COMPLETE DATA AND SAMPLES

AIRLINE WELDING and ENGINEERING

785 N. PRAIRIE, HAWTHORNE, CALIF., ORegon 8-5112 - OSborne 5-2225

cut weld cleaning time by 85%

Throw away your cold chisel and whisk off weld spatter with a dry rag! Protect-O-Metal spatter-proofing compounds make weld cleaning a breeze. Improve your welds at the same time — P-O-M compounds quiet the arc, improve fusion and electrode operation, prevent oxidation and annealing scale, cause no porosity. No smoke, odors, or fumes.

P-O-M No. 2. Non-inflammable, non-toxic, water-soluble paste. Inorganic. Thin before applying and start welding at once. $3.30 per gallon, f.o.b. Dayton.

P-O-M No. 8. Rust- and corrosion-resistant resin base compound. Comes ready to use. Safe for all metals. Good paint primer; permits outdoor storage of sub-assemblies. $3.35 per gallon, f.o.b. Dayton.

MONEY-BACK TRIAL OFFER

Order a trial gallon of each today for testing in your shop. We'll cancel the bill if you're not satisfied.

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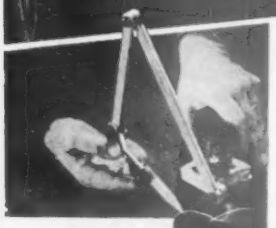

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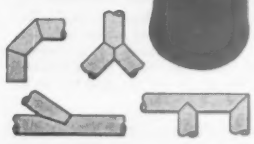
A SMOOTH SWING of the Contour Marker's soapstone point and you're ready to cut! It's easy and *absolutely accurate* because there is an angle dial calibrated in both degrees and pitch. Any of the pipe joint angles shown can be marked off in minutes. And you save "man hours" as well as oxygen and acetylene gas because "cut and try" methods are completely eliminated. Two sizes are available complete with adapter for marking structural steel. Standard, for pipes from 1½" to 18" dia.; Jumbo, for pipes from 16" to 48" dia. Instruction book included. Belt case available. Write for information



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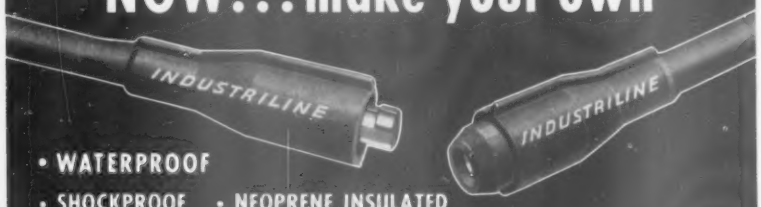

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CABLE CONNECTORS

Now, for the first time, a 110-volt portable molding kit that anyone can operate, to seal cable connectors in waterproof, shockproof, neoprene insulated sleeves . . . in the plant . . . in the field . . . in minutes!

Tapered sleeve connection assures a waterproof joint when connector is locked. Low cost . . . rugged . . . simple . . . economical . . . factory and field test proven.

New kit, with its heavy-duty crimping and vulcanizing press plus 4 parts, are all you need. Eliminates soldering, short circuits, flexing and breaking of cable strands, down-time, wear, breakage and corrosion. Connectors employ a positive lock for high conductivity yet can be taken apart instantly.

Get the facts today on this revolutionary new product. Write for Catalog No. 131, or see it and the complete *CAM-LOK line* at *The Welding Show, Booth No. 219, Buffalo, New York, May 9-11.*

cam-lok DIVISION
EMPIRE PRODUCTS, INC., P.O. Box N-98, Cincinnati 36, Ohio

Be careful with oxygen!

Two recent accidents, in different parts of the world, emphasize the danger of not being careful with oxygen.

An explosion of oxygen tanks being loaded onto a truck in front of a welding supplier in the Bronx, N. Y., injured three men. The explosion set fire to the truck, shattered windows in the supplier's building and injured a passerby.

A heavy oxygen tank falling from atop a truck in Hobro, Denmark, exploded, killing one person and injuring two. The fall broke the tank's valve, freeing the highly compressed contents.

The first blast threw a boy and girl through a shop window. The tank then hit a stone embankment, rose 100 ft. into the air, killing a woman in its downward rush. It then shot down the street, hitting automobiles, parked bicycles and scattering passersby before exhausting its supply of energy.

Moral of this story? Be careful with oxygen, it can be deadly when not treated with proper respect.

Navy sub-contracts to small business

Small business interested in subcontracts from the Navy will profit from review of the third edition of a Navy Department pamphlet.

Entitled "Selling to Navy Prime Contractors," the pamphlet lists 500 Navy prime contractors in 41 states who sub-contract work to small business. Also included is a directory of Industry Cooperation Representatives located at Navy general inspection offices.

Copies of the booklet are available upon request to the Small Business Branch, Office of Naval Material, Navy Department, Washington 25, D. C.

NCG purchasing office moves

All purchasing functions and personnel of National Cylinder Gas Co., Chicago, have moved to the plant location at 4700 W. 19th St., in that city. The move consolidates all buying functions.

Thor Power Tool moves Denver office

The Denver branch office of Thor Power Tool Co., Aurora, Ill., has been moved to new, enlarged quarters at 2704 W. 8th Ave. in Denver.

Tiered building is tired, sags

An auto parking building in Cleveland, evidently tired of standing, started to sag recently. The building, currently under construction, sagged to an angle of 20 deg before it was braced by steel cables.

The City of Cleveland has ordered the structure torn down. A city official felt the cause of sag could be attributed to the fact that the builders did not utilize welding in providing ing proper bracing.

Elect president of Salt Bath Institute

Edward N. Case, sales manager of Ajax Electric Co., Philadelphia, was recently elected president of the newly-formed Salt Bath Institute, Cleveland. Headquarters of the institute are at 7307 Euclid Ave., Cleveland.

Tool distributors study replacement

Machine tool replacement was one of the discussion topics at the recent spring meeting of the American Machine Tool Distributors' Association in Detroit.

The meeting was keynoted around creative selling and exploration of methods by which the distributor can accelerate replacement purchases.

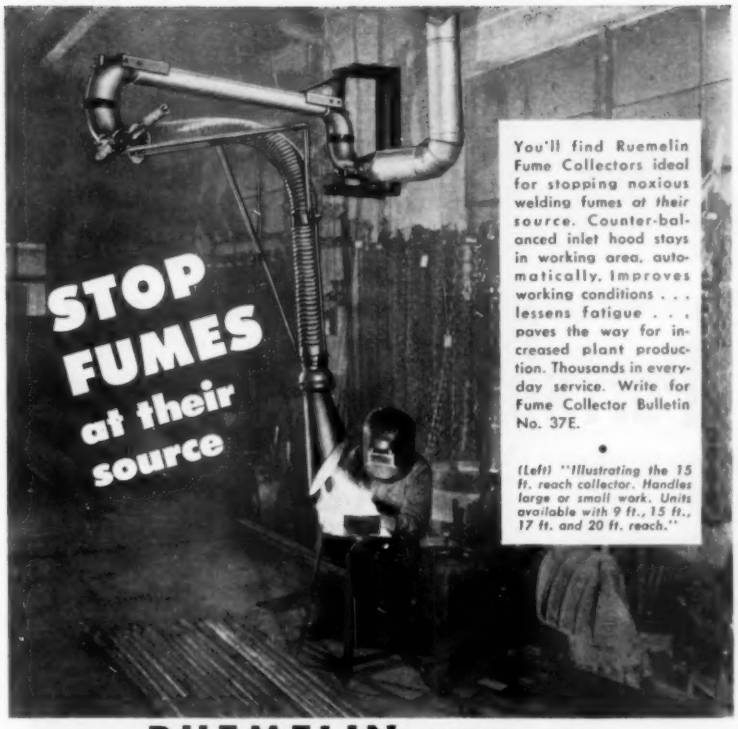
A conclusion of the meeting was that creative selling on the distributor's part is necessary to explore the replacement market and meet customer needs. Some gage must be determined for deciding when, where and what replacement should be made. It was felt that the only way industry can meet the economic demands and potential growth of the next decade is through use of modern equipment providing increased productivity.

Electro Refractories forms new department

A new product engineering department has been established by the grinding wheel division of Electro Refractories & Abrasives Corp., Buffalo, N. Y. The department will be headed by William Eames.

GE research in Zurich, Switzerland

Permanent address of General Electric Co.'s research laboratory's new European office is Pelikanstrasse 37, Zurich 1, Switzerland.



You'll find Ruemelin Fume Collectors ideal for stopping noxious welding fumes *at their source*. Counter-balanced inlet hood stays in working area, automatically. Improves working conditions . . . lessens fatigue . . . paves the way for increased plant production. Thousands in everyday service. Write for Fume Collector Bulletin No. 37E.

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(Left) "Illustrating the 15 ft. reach collector. Handles large or small work. Units available with 9 ft., 15 ft., 17 ft. and 20 ft. reach."

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Silver Brazing Alloy preforms for Production Brazing. Rings, Stamped or Coined Washers and Wire Forms

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1200 FLUX

Use when silver brazing Brass, Bronze, Copper, Nickel-Silver, Steel, Stainless Steel, Monel, Nickel, Inconel and other Nickel alloys. Furnished in ½ lb., 1 lb., 5 lb., 30 lb., and 65 lb. containers.

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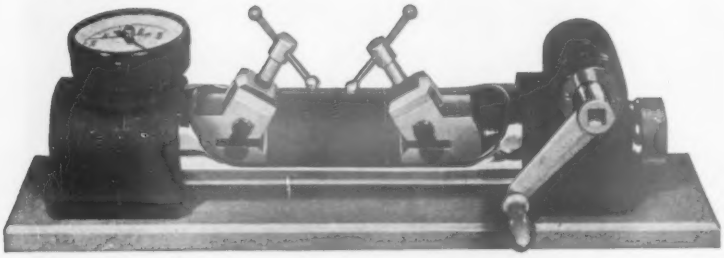
PLANTS: DETROIT, ST. LOUIS, MILWAUKEE, MINNEAPOLIS, INDIANAPOLIS
OFFICES: KANSAS CITY, GRAND RAPIDS



For shop or field—a new

Portable Tensile Tester

Use this compact, precision tensile tester to test strip steel, wire, bolts, spot welds, or anything else within its 4,000 lb. capacity. Besides its use for inspection work in the shop, this portable device provides a convincing method of demonstrating the tensile strength of various materials in sales demonstrations and trade shows.

Only a moderate pull on the crank is sufficient to apply the maximum load. Results are easily read from the load gauge. Simple to use, anywhere, any time. Write for catalog sheet and price.

DETROIT TESTING MACHINE COMPANY

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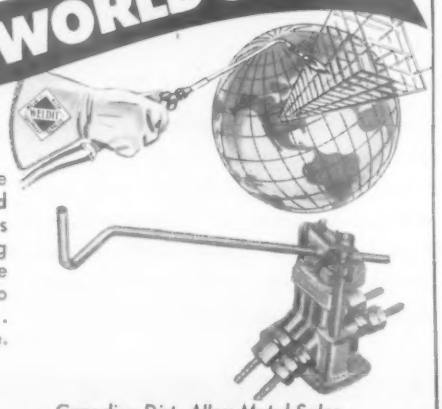
Weldit

THE WORLD'S FINEST GASAVER USED the WORLD OVER!

The Weldit Gasaver is the original gas saving method of cutting production costs by automatically shutting off gas and oxygen intake lines when not in use. No dangerous idle flame . . . an important safety feature.



Canadian Dist. Alloy Metal Sales, 181 Fleet St., E., Toronto 5, Ont.

Weldit INC. SINCE 1918

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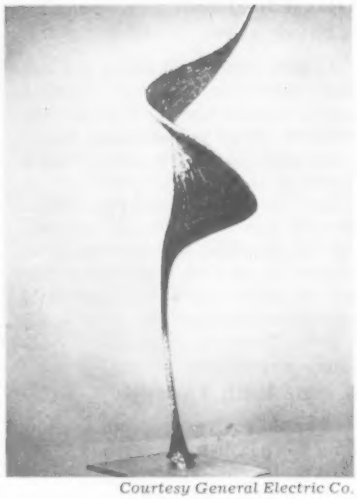

Courtesy General Electric Co.

Impressions of music welded in steel

California sculptor John Sillstrop welds music into steel. Impressions aroused upon hearing a musical composition are first sketched. The sketch is then used as a blueprint for creating the welded sculpture.

The piece shown above is Sillstrop's view of the rhythmic Habenera. The shape is so formed to convey the musical sound pattern. The slender stem at top illustrates the muted sound at the beginning of the music. As the music becomes louder the stem broadens. The abrupt ending is conveyed by the poised appendage at the base.

Work is begun on a hand-formed or heat-forged skeleton of steel. Sillstrop then builds up layers of welding bead. The process utilizes many pounds of electrodes, the Habenera requiring 300 lb.

Aluminum wire given oxide coating

A new process of anodizing aluminum wire, with alternating current, to give it a ductile oxide coating has been developed by Aluminum Co. of Canada, a subsidiary of Aluminum Ltd., Montreal. The coating, it is reported, functions as an electrical insulation.

The development it is felt will open new horizons in design of electrical motors and other electrical equipment. Equipment wound with such light, heat-resistant, aluminum wire could be made smaller and lighter, and could run hotter, the company reports.

Manufacture of the wire involves pulling the aluminum wire through tanks containing chemical solutions which give it a hard thin coating.

Lincoln offers cash for arc welding ideas

A total of $20,000 in cash awards is being offered by The James F. Lincoln Arc Welding Foundation, Cleveland, for ideas or suggestions that will accelerate progress in arc welding.

Eligible for entry in the Welding Progress Awards competition are residents of the United States or its possessions. The Foundation extends an invitation to submit ideas on any aspect of arc welding that can be used to advance welded design, welding engineering or the general application of the arc welding process.

No restrictions are placed on either the nature or the extent of ideas that may be submitted for award.

Suggestions may refer to such problems as: publicizing advantages of arc welding; how successful experience of welded structures may be more generally known; simplification of restricting codes or specifications; how to make available knowledge of welded design; improvements in teaching of welded design; how can processes and products of arc welding be bettered; how can inspection of welding be simplified, eliminated or improved. The above are but a few examples of the possibilities.

The $20,000 fund will be distributed in 20 awards with top award of $5,000. Entries will be judged primarily on value of suggestion. Judging factors will include practicality, usefulness, ingenuity, applicability.

Complete information and rules are available from The James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio. Entries must be submitted by July 30, 1956.

ASTE elects officers

The American Society of Tool Engineers, Detroit, recently elected Howard C. McMillen, president. He is plant manager of Philco Corp.'s Bedford, Ind., plant. He succeeds Dr. Harry B. Osborn, Jr.

GE X-ray expands marketing section

The X-ray department of General Electric Co., located in Milwaukee, has divided its marketing section into two groups. One section, directed by Gordon E. Williams, will deal with medical X-ray; the other, directed by Edward W. Philleo, will deal with industrial X-ray.

When heavy, unwieldly weldments like these diesel crankcases can be quickly swung into any position so that every weld is made *downhand* —that's efficient welding!

Welders spend more time welding—do better welding at lower cost when they work with C-F Positioners because these hand and/or power operated machines reduce positioning time to a minimum. Investigate the cost-saving advantages of C-F Positioners. They pay their way in any company.

Write for Bulletin WP26—an illustrated circular detailing the *Specific* advantages of C-F Positioners.

CULLEN-FRIESTEDT CO.
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CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

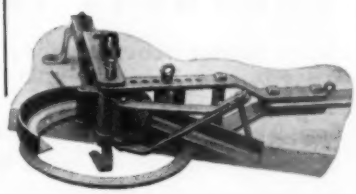
C-F positioned welds mean better, more economical welds

CHECK YOUR BENDING PROBLEMS HERE:

These are representative of the 101 different bends you can quickly set up with a

HOSSFELD
UNIVERSAL®
IRON BENDER

- ☐ Pipe
- ☐ 90° Bends on Heavywall or Standard Pipe
- ☐ Steel Tubing
- ☐ "U" Shapes, "U" Bolts, Square Cornered "U" Bolts, Clevises, Hooks, Links
- ☐ Angles, Offsets
- ☐ Square Bends, Irregular Shapes on Flat Stock
- ☐ Eye Bolts, "S" Shapes, Round or Square Stock
- ☐ Rings, Coils
- ☐ Centering Large Diameter Eyes
- ☐ Sharp, Square Bends on Flat Stock
- ☐ Flat Eyes, Automobile Spring Eyes
- ☐ Angle Iron Flange In or Out
- ☐ Flat Stock Edgeways
- ☐ Round or Square Eyes on Flat Stock, Wire
- ☐ Conduit, Heavy or Thinwall



Get The Facts! Write for bulletin showing bender models, standard and special dies, and illustrations of bends.

The Hossfeld Universal Iron Bender is indispensable for maintenance and production work in metalworking, custom welding and repair shops, industrial and engineering plants, institutions, and vocational departments in colleges, universities, trade and high schools. It replaces special bending equipment. A Hydraulic Attachment (optional) enables one man to bend heavier material.

HOSSFELD MFG. CO.
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Alloys and Fluxes for joining and sealing

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SOLDERING · FILLING · SEALING

TORCH BRAZING

FURNACE BRAZING

ARC WELDING

SWITCHED TO A-S NO. 13

Company Processing Sugar Beets

They Switched to Nickel-Silver for Retreading with Wear-Resisting Build-Up Metal!

They spent $23.74 *more* for 100 lb. of Nickel-Silver . . . *saved* $150.50 in other costs incident to repair of this one spindle. They repeated on 8 spindles. All-State No. 13 Nickel-Silver Build-Up Rod is now their standard for retreading.**

ALL-STATE No. 13 is Famous for Savings!

- 20 lb. saved replacement of a $1300.00 packing gland journal
- 25 lb. saved $510.00 net on finely heat-treated gears
- Hundreds other case histories of Savings

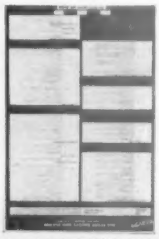
10 lb. No. 13 will start saving money for you. Comes bare or flux-coated.

**Details on request

See Live Demonstrations
Booth 35 AWS SHOW

FREE

Ask for Buyers Guide. This is book full of product solutions to metalworking problems.



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Put one up in your supply room . . . another on your shop wall . . . to help guide selection of the right Alloy and Flux for the job at hand.

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Ask your A-S Distributor for Copies. He'll also give you same data in a folder to fit 3-ring binder.

ALL-STATE WELDING ALLOYS CO., INC., WHITE PLAINS, N. Y.

a NEW product . . .
means NEW time saving . . .
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York's

SPAT-R-PRUF COMPOUND 106

Don't sputter about spatter . . .
JUST WIPE IT OFF!

Completely eliminates grinding after welding. Just one coat, and spatter can be wiped away with a dry cloth.

Available 1 or 5 gal. cans, 5 gal. drums

- NO STIRRING OR DILUTION
- NON-TOXIC
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3 in 1 York's '77'
SPECIAL FLUX
FOR GENERAL BRAZING
FOR CAST IRON WELDING
FOR CAST IRON BRAZING

Westinghouse develops new impact test

A new method for determining transition points between ductile and brittle metal zones has been developed by scientists at Westinghouse Electric Corp., Pittsburgh. The new technique employs an impact guillotine and a metal sample, 14 in. long by 3½ in. wide, and 1 in. thick.

A weld bead is first put on the bottom side of the sample and an artificial crack created in the weld by an abrasive cutting wheel. A standard weight is then dropped on samples at various temperatures. The transition temperature is said to be readily determined within a narrow range.

The method was developed because of certain disadvantages of the Charpy notch impact test. Sample preparation required considerable time; final data of exact temperature of transition from ductile to brittle was not clearly defined. It is reported the new method creates reproducible results and cuts sample preparation time to one-third.

Discuss nuclear technology

Developments in nuclear energy will be a topic of the Industrial Nuclear Technology Conference to be held May 15 and 16 at the Museum of Science and Industry, Chicago.

Five leaders in the field of nuclear energy will tell what developments can be expected in the next five years in the non-power industrial applications of atomic energy.

Distributor appointments

Ampco Metal, Inc., Resistance Welding Department, Milwaukee: Frank Brandt, Saugus, Mass.; Moehlenpah Engineering, Inc., Des Moines, Iowa; Keenan Welding Supplies Co., Inc., Albany, Ga.; Metz Welding Supply Co., Milwaukee; Miami Welding Supply, Inc., Miami.

Safety tool distributor: Neill-Lavielle Supply Co., Louisville, Ky.; Hansen & Yorke Co. of New Jersey, Woodridge, N. J.; Baldwin Supply Co., Charleston, W. Va.; Holloway Bros., Wilmington, Del.; A-C Supply Co. of Philadelphia, Philadelphia; Cornwell Tool Co., Atlanta, Ga.; Maddock & Co., Inc., Philadelphia; Scientific Industrial Supply Co., Chicago; Tools, Inc., Houston; Watkins-Cottrell Co., Richmond, Va.

Inductotherm Corp., Delanco, N. J.: Gordon Sondraker & Co., Los Angeles; Industrial & Foundry Supply Co., Inc., San Francisco.

L. W. Fleischer, the former southern district manager of Coyne Cylinder Co., has been appointed executive vice-president of all Coyne companies. He will make his headquarters in the San Francisco general office. Replacing him at Memphis is *Charles F. Cahill*, formerly of the Pacific division.

Dr. Carl Frederick Floe has been elected a director of Walworth Co., New York City manufacturer of valves and pipe fittings. Dr. Floe is professor of metallurgy and assistant provost at the Massachusetts Institute of Technology. He will give direction, on the policy level, to Walworth research.

Recently appointed to the board of directors of Eutectic Welding Alloys Corp., Flushing, N. Y. were *Joseph Hambuechen* and *Noel B. McLean*. Mr. Hambuechen will advise Eutectic on domestic and overseas expansion operations; Mr. McLean will assist in production welding and brazing operations. In addition, *Harley Erickson* has been named production manager. He was formerly general foreman of production for Lincoln Electric Co. and Westinghouse Electric Corp. Mr. Erickson will develop new manufacturing methods and aid in production and quality-control programs.

Erickson

Charles F. Parthum has been appointed advertising and sales promotion manager of Harnischfeger Corp., Milwaukee. He was formerly associated with the Buchen Co., Chicago.

Forrest W. Johnson has been named quality supervisor and *Gordon W. Reeder* has been named plant metallurgist by American Welding & Mfg. Co., Warren and Niles, Ohio. Mr. Johnson succeeds R. E. Goodman, previously promoted to superintendent of finishing operations.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

FOR WELDING AND CUTTING...

IN THE RED DRUM

HIGHEST QUALITY

DUST-FREE

NATIONAL CARBIDE

Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

National Carbide Company

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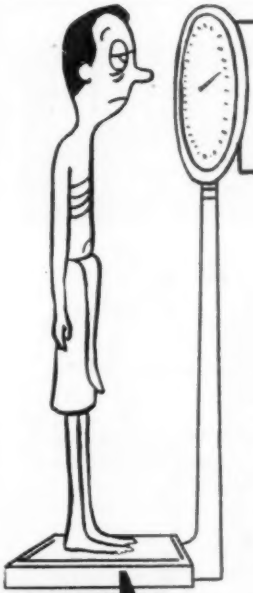
A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED



SHORT WEIGHT *can mean* SHORT LIFE

Although there is not a pound of excess weight in a Harrisburg Cylinder, we do not offer the questionable advantage of shaving off essential material to save a few pounds in weight. It is obvious that this could only compromise both durability and safety.

For High Pressure Gas Cylinders, industry has learned to expect a useful life of a quarter-century or more. Traditionally, this life expectancy is based on long-established Harrisburg standards of design and manufacture.

When you buy Harrisburg Cylinders you can continue to expect the sound values that have been characteristic of all Harrisburg products for more than a century.

Send for HARRISBURG Cylinder literature and prices.

More than a century in Harrisburg

Harrisburg Steel

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HARRISBURG 8, PENNSYLVANIA

toughest metal known —
resists abrasive wear . . .

MANGANAL

T.M. REG. U.S. PAT. OFF.

11%-13½% MANGANESE-NICKEL STEEL

SPECIAL SHAPE APPLICATOR BARS

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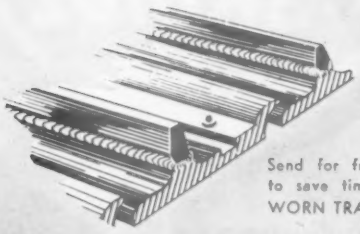

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Heiden

Loup

Ray W. Heiden has been appointed director of manufacturing by Progressive Welder Sales Co., Detroit. He will be in charge of the Company's manufacturing operations. *Ronald L. Loup* has been named director of engineering for all the company's divisions. This promotion follows his recent appointment as chief engineer of the welding machine division.

L. S. Wilcoxson, vice-president of the Babcock & Wilcox Co., New York City, was recently elected to the board of directors. In addition to his duties as a director, he will continue in charge of the company's boiler division.

A. William Fraser and *Clarence S. Wentworth* have been appointed commercial vice-presidents of Worthington Corp., Harrison, N. J. Mr. Fraser is in charge of district sales offices at Chicago, Denver, Kansas City, St. Louis and Minneapolis. He headquarters in Chicago. Mr. Wentworth is sales manager of the central region, with headquarters at Cleveland. *C. R. Stempf* has been named manager of the newly created standard products section of the Worthington Export Dept. *George F. Guldner,* purchasing manager of the Harrison division, has retired after 50 years with Worthington Corp. He became associated with Worthington in 1906 when the firm was known as the International Steam Pump Co., Inc.

William Younger has been named eastern sales manager and *William Moriarty,* distributor sales specialist by Square D Co., Detroit. Both positions have been newly created. Mr. Younger has been Square D's merchandise sales and advertising manager and Mr. Moriarty has been manager of the York, Pa., field office. Both will headquarter in Detroit.

Milton Forman has been appointed vice-president of Alpha Tank Co., Inc., Long Island City, N. Y. He is a member of the American Welding Society and the American Society for Metals.

A. J. Pluhar has been named manager of the non-destructive testing division of Warnock Hersey Co., Ltd., Montreal, Canada. He has had experience in engineering and in managing the research and practical application of welding and non-destructive testing techniques. Mr. Pluhar is a member of the Association of Professional Engineers of Ontario and has been active in welding and engineering societies in Canada, the United States, England and Switzerland. He will headquarter in Toronto.

D. L. Mathias retired recently as research engineer of Arcrods Corp., Sparrows Point, Md. He has authored numerous papers and held many patents pertaining to metal-arc welding. Mr. Mathias entered the welding field, after several years in metallurgy, in late 1928 when he became associated with Westinghouse Electric & Mfg. Co. at East Pittsburgh, Pa. Here he initiated research and development of bare and covered electrodes. In 1936 he became associated with Metal & Thermit Corp. in charge of research and development of electrodes and welding applications. He joined Arcrods Corp. in 1950. Mr. Mathias will remain in the welding field as consultant.

Frank N. Phelps, Jr. has been named advertising manager of the oxyacetylene welding and cutting apparatus division of Modern Engineering Co., St. Louis, Mo.

Frank W. Jenkinson has been appointed district manager in the Cleveland area by Adamas Carbide Corp., Kenilworth, N. J.

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Plasticity

INTRODUCTION TO PLASTICITY. By Aris Phillips. Published by Ronald Press Co., New York City, 1956. Cloth, 6 by 9 in., 230 pages. Price $7.

This is an introductory text, written from the point of view of the stress analyst. It is designed for the advanced student and graduate student in engineering as well as the practicing engineer.

The book consists of nine chapters: the first six deal with one-dimensional problems, while the last three consider problems of combined stresses. In developing the subject, the author begins with the simple condition of axial loading, showing how the behavior of an indeterminate truss is influenced by the plastic behavior of its members. The discussion then moves to a consideration of such subjects as: calculation of collapse load, moment-curvature diagram, bending with axial force, deflections, curved bars, stress-strain relations, collapse and strain hardening under combined stresses.

An informative text, it should also be of interest to aeronautical, civil and mechanical engineers as well as stress analysts. While the mathematics is complicated, it is said to be no more so than necessary to explain the principles of the theory of plasticity and provide the student with a foundation for formulating and solving problems.

Modern physics

MODERN PHYSICS: A TEXTBOOK FOR ENGINEERS. By Robert L. Sproull. Published by John Wiley & Sons, New York City, 1956. 491 pages. Price $7.75.

As the title implies, those aspects of 20th century physics are discussed that are of greatest engineering interest. Analytical in approach, the book treats crucial experiments in the field, building the elementary theory underlying the properties of atoms, molecules, solids and nuclei on this treatment.

The book directs the use of modern physics toward a practical understanding of processes, instrumentation and the properties of materials.

The author is an associate professor of physics.

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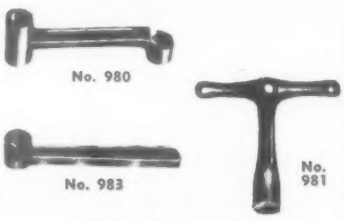

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Welding titanium

SPOT AND SEAM WELDING OF TITANIUM AND TITANIUM ALLOYS. Published by Office of Technical Services. U. S. Department of Commerce, Washington, D. C., 1956. 189 pages. Price $4.75.

A handbook of information on welding titanium and its alloys, this is the final report by North American Aviation, Inc., done for the Navy Bureau of Aeronautics.

Applications of welding processes are discussed. The report finds that these processes may be readily applied to production grades of commercially pure titanium sheet, oxygen-nitrogen titanium-base alloy Ti-100A and 8% manganese titanium-base alloy. Simple welding equipment of a-c type is described as most suitable and a wide range of settings may be used. Surface preparation treatments were found necessary only on heavily oxidized material or where surface conditions varied. Of special interest is the quality of welds.

Standards

PROCEEDINGS, 1955, STANDARDS ENGINEERS SOCIETY. Published by Standards Engineers Society, Camden, N. J., 1956. Paper, 80 pages. Price $3. Available from the Society, P. O. Box 281, Camden, N. J.

Covering the proceedings of the fourth 1955 annual national meeting of the Standards Engineers Society, this volume contains 24 papers by national authorities. The discussion of standards includes organization of company standards program, standardization of electrical apparatus, standards in consumer goods distribution, the American standard for preferred thin flat metal thicknesses, standards and automation, and the future of standards. Of interest is the discussion of voluntary vs. mandatory standards.

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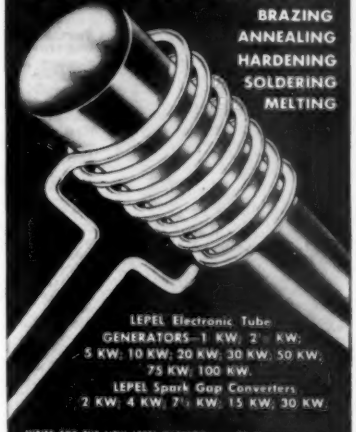

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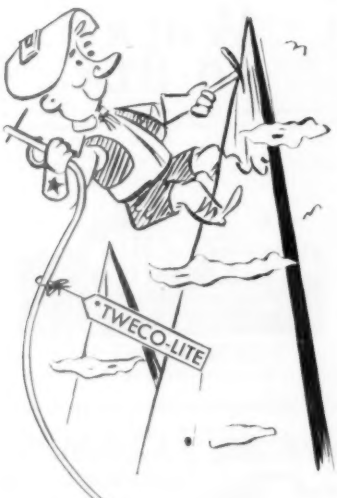

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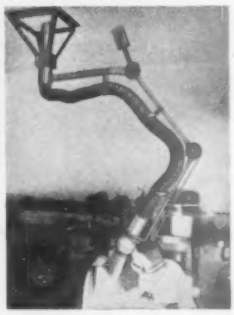

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30 YEARS AGO

(Taken from *The Welding Engineer of May, 1926*)

E. L. Mills, sales manager of Bastian Blessing Co., Chicago, is the proud father of a 9-lb boy.

— 30 YEARS AGO —

New members of the Compressed Gas Manufacturers Association are: Newport Mfg. Co., Milwaukee; British Oxygen Co., London; Gas Engineering Co., Trenton, N. J.

— 30 YEARS AGO —

Smith's Inventions Inc. has changed its name to Smith Welding Equipment Corp.

— 30 YEARS AGO —

E. G. Luening recently joined the Kentucky Oxygen-Hydrogen Co., Louisville, Ky. Mr. Luening is well known as a consulting engineer in the oxygen industry.

— 30 YEARS AGO —

King Bros. Boiler Works, Portland, Ore., plans to build a new welding shop in that city. Projected equipment will furnish complete welding service. Arthur R. King is president; Fred C. King, secretary-treasurer; and Edward R. King, manager.

— 30 YEARS AGO —

Louisiana Oxygen Co., Mobile, Ala., will construct an addition to its plant for production of acetylene.

— 30 YEARS AGO —

J. J. Crowe of Air Reduction Sales Co., New York City, recently presented a paper on efficiency of oxygen purity for cutting in foundry practice before the Pittsburgh Foundrymen's Association.

— 30 YEARS AGO —

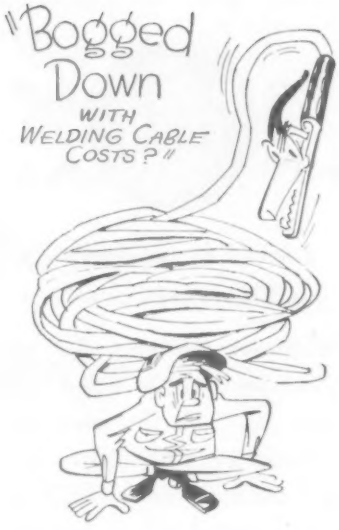
The Chicago office of Thomson Electric Welder Co. has moved to 549 Washington Blvd. in that city.

— 30 YEARS AGO —

A feature article describes electric-arc welding of a locomotive tender tank by Boston & Albany Railroad. Tanks have previously been riveted.

— 30 YEARS AGO —

During the past month H. H. Max Fuschel, a member of the central office of the German State Railway System, and chairman of the welding committee of the German Engineers Society, has been touring welding departments of large industrial plants in the United States.



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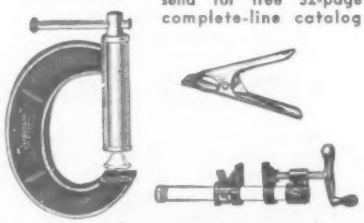

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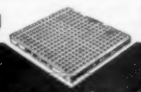

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51. FLAME-CUTTING — Livesay Industries, Inc. Illustrated 4-page folder describes flame-cutting operations with "Livesay" flame-cutting machine.

52. POWER SUPPLIES—Howard Industries, Inc. Catalog No. 54-A describes variety of motors and gear-reduction units.

53. TEMPERATURE INDICATOR—Tempil Corp. "Temperature Rise Problems?" is reprint of concise, one-page article covering "Tempilaq" temperature indicator.

54. SPOT WELDERS—Scientific Electric. 4-page brochure illustrates custom-built precision spot welders.

55. HARDENING POWDER—Anti-Borax Compound Co., Inc. Pocket-size folder (Form R55) discusses how to case-harden with "Royal" hardening powder.

56. CYLINDERS, CONTAINERS—Superior Air Products Co. Folder describes gas containers, Dewar flasks, in various sizes for number of uses.

57. PLASTIC WELDING — American Agile Corp. Catalog, fully illustrated, details line of welding and spraying equipment, plastic weldments and mouldings.

58. INDUCTION HEATING — Induction Heating Corp. 50-page booklet covers induction heating, including advantages of process.

59. BRAZING FLUX—Sherman & Co. Folder discusses "Nu-Braze" fluxes for brazing.

60. RECTIFIERS, THYRATRONS—Chatham Electronics. Pamphlet illustrates and describes rectifiers, thyratrons, and other special-purpose tubes.

61. MOISTURE CONTROL—Van Products Co. "Air, Water and Industry," is a booklet discussing compressed air problems with solutions to excessive moisture.

62. PLANISHING — Airline Welding & Engineering. Catalog sheet gives specifications and uses of roll-planishing fixture for use in welding field.

63. DUST COLLECTOR—Torit Mfg. Co. 16-page catalog illustrates and describes line of dust collectors, with accessories, aids to selection.

64. PRESSURE VESSELS—Foster Wheeler Corp. Illustrated Bulletin GS-56-4 describes, in 18 pages, specialized facilities for fabrication of unusual weldments, pressure vessels and high pressure piping.

65. GRINDING WHEELS—Electro Refractories & Abrasives Corp. Bulletin T-855 discusses grinding wheels for use on tools and cutters.

66. BRAZING—Handy & Harman. Production brazing is discussed in (No. 72) *Low-Temperature Brazing News.*

67. METAL CLEANER—Oakite Products, Inc. Handy folder describes properties of solvent detergent "No. 98" for cleaning metal and protecting against rust.

68. AMMETERS — Columbia Electric Mfg. Co. 8-page bulletin (Form TT-5515) illustrates and describes selection and use of "Tong Test" ammeters.

69. MAGNETIC PLATE CLAMP—Portomag, Inc. Illustrated sheet outlines construction and applications of electro-magnetic plate clamp for welding.

literature . . . . . USE CARD ON PAGE 149

70. HARDFACING—Haynes Stellite Co. *Haynes Alloys Digest* (Vol. 7 No. 4) has interesting discussion of hardfacing problem and solution.

71. GRINDING WHEEL — Bay State Abrasive Products Co. 8-page booklet explains, with illustrations, new electronic process for construction of grinding wheels.

72. TUBE CUTTER — I. A. Woerner. 4-page folder treats hydraulic-operated pipe and tube cutter. Can be adapted to positioner for welding operations.

73. AUTOMATIC WELDERS — Morton Mfg. Co. Bulletin No. 55 is full discussion of several types of automatic welders, including seam, contour, stake.

74. WELDING DATA—Eutectic Welding Alloys Corp. 16-page "Picture Book of Facts on Eutectic's Welding Processes" (TIS 2367) gives helpful information on "Low Heat Input" metal-joining process, including technical data, actual case histories.

75. FLAME-CUTTING TORCH — Buckle Flame Cutter Co., Ltd. Descriptive folder is informative outline of construction and usage of "Paragon" cutting torch.

76. STEEL-GRIT ABRASIVE — Wheelabrator Corp. Bulletin 901-D discusses steel-grit blast-cleaning abrasive "Steeletts" for etched finishes on metal.

77. CUTTING TOOLS—M. A. Ford Mfg. Co., Inc. 12-page Catalog 601 is organized for easy reference to complete line of cutting tools.

78. SOLDER SELECTION—Anchor Metal Co., Inc. Quick reference to melting points of solder alloys is provided by handy selection chart, including breakdown of industrial uses.

79. INDUSTRIAL WELDERS—The Lincoln Electric Co. Illustrated leaflet describes "Shield-Arc" d-c engine-driven welders, with applications included.

80. FLUX RECOVERY—Invincible Vacuum Cleaner Mfg. Co. Booklet treats recovery of flux in industrial welding, with case histories and typical installations.

81. WELDER FILTER—Air Filter Corp. Catalog Sheet (Form L-701) describes "Airsan" welder filter, fitting standard welding machines.

82. LIGHTERS, FLINTS—Matchless Utilities Co. Illustrated sheet lists types of gas lighters and flints for weldors.

83. PORTABLE WELDER—Mid-States Welder Mfg. Co. Catalog sheet (Form ZIP-755) describes and illustrates "ZIP" portable spot welder for variety of applications.

84. SELENIUM RECTIFIER — International Rectifier Corp. Bulletin SR-124 treats sub-miniature selenium relay rectifier to energize d-c relay coils.

85. TOGGLE CLAMP—Robert J. Kelly Mfg. Co. Descriptive literature discusses toggle clamp "No. 45W" for welding.

86. ABRASIVE CLEANER—Clementina Ltd. 4-page leaflet (Form No. 91555) is discussion of blast cleaning with "Educt-O-Matic" air abrasive cleaning tool.

87. SPOT WELDER—Duro-Dyne Corp. Booklet describes, with illustrations, "Greyhound" portable and stationary self-contained spot welders.

88. INDEXING UNITS—Ferguson Machine & Tool Co. 24-page catalog No. 106 contains full selection and application data on high-speed indexing units. Attention is given to welding usage.

89. SOLENOID VALVES—Atkomatic Valve Co., Inc. Comprehensive Catalog 200 describes electrically-operated two-way solenoid valves for air, gas, steam and liquid flow control.

90. STAINLESS ELECTRODES—The McKay Co. "Quality control of stainless electrodes" is reprint of article from WELDING ENGINEER. Contains illustrations and technical data.

91. PRODUCTION WELDING—Pandjiris Weldment Co. Illustrated catalog contains complete line of production welding equipment, including positioners, turning rolls, welding head manipulators and special automatic welders.

92. RESISTANCE METER—J. W. Dice Co. Bulletin 3052 gives applications and construction, with illustrations, of "Model 151-S" microhm meter for measuring surface resistance of metals prior to welding.

93. PORTABLE WELDER—Brennen, Bucci & Weber, Inc. Illustrated sheet describes "Bren Weld" portable band saw blade welder.

94. TURNING ROLLS—Aronson Machine Co. Booklet, providing specifications and illustrations, discusses types of turning rolls for welding.

95. WELDING NEWS—Ampco Metal, Inc. The first quarter issue of *Ampco Welding News* describes use of metal arc process in hardfacing crimping rolls; includes other case histories.

96. FLUOROSCOPIC TESTING — North American Philips Co., Inc. 3-page bulletin graphically depicts fluoroscopic examination of welds.

97. GRINDING WHEELS — Electro Refractories & Abrasives Corp. Pictorial bulletin GS-55 describes grinding wheels for use on ferrous and non-ferrous metals.

98. DEGREASING, GRINDING—Acoustica Associates, Inc. 4-page, two-color bulletin MW-103 describes ultrasonic techniques in cleaning, degreasing, grinding.

99. WELDING PROCEDURES—Eutectic Welding Alloys Corp. 140-page booklet data book (T IS 2575) features simplified welding procedures for base metals, covering 120 welding rods, electrodes and compounds. Also treats brazing and soldering, repair, salvage.

100. WELDING FITTINGS—Tube Turns. Folder describes wrought iron welding fittings, flanges, giving dimensional data, discussing also physical properties and typical applications.

101. RADIOGRAPHY — Balteau Electric Corp. Booklet graphically outlines construction and uses of "Baltograph 200" portable X-ray unit.

102. TORCH TIPS—National Torch Tip Co. Illustrated sheets list replacement tips for number of cutting and welding torches.

103. VALVES—Rivett Lathe & Grinder, Inc. Complete line of valves, cylinders and power units—illustrated with cross-section views, including data on air and hydraulic valves—are featured in new bulletin.

104. METALWORKING—Carboloy Dept. Catalog No. GT-310 "Carboloy Cemented Carbides for the Metal-working Industry" covers in 66 pages carbide grade selection, including most effective cutting speeds.

105. SPEED REDUCERS—Revco Inc. 11-page catalog describes "Zero-Max" variable speed reducer, employed in turning rolls, flame-cutters, welding jigs.

106. HARDFACING—Coast Metals, Inc. Hardfacing with "No. 18" and "No. 118" hardfacing alloys is topic of folder.

107. BRAZING—American Silver Co., Inc. Bulletin BC-51 treats "Braze-clad" method of silver brazing.

108. ARC WELDER—Mid-States Welder Mfg. Co. Catalog sheet describes and illustrates "Viking" d-c arc welder for industrial welding.

109. BLAST CLEANER — Victor Equipment Co. Illustrated sheet gives pictorial resume of cleaning metals, removing rust, with "Cyclone" blast cleaner.

110. HEAT TREATING — Ajax Electric Co. *Tips and Trends* (Vol. 9, No. 1) contains case histories of salt-bath heat treating, including bibliography of current heat-treating literature.

111. WELDING STEEL — The Lincoln Electric Co. Automatic welding of alloy steel is subject of illustrated catalog sheet (Bul. S-101).

112. METAL HARDENING — Barnebey-Cheney Co. Bulletin J-35 details composition and uses for metallurgical carbon, as in heat treating compounds, metal hardening, grit blasting.

113. WELDER CONTROL — Metron Instrument Co. Bulletin No. 105 describes line of stationary tachometers for speed measurement of welders, generators, rotating and traveling equipment.

114. WELDERS — The Taylor-Winfield Corp. Dial feed welders for production of small welded assemblies are described in No. 563 of *Weld-It*.

115. VALVES—Crane Co. 23-page illustrated catalog describes packless diaphragm valves for handling carbon dioxide, acetylene, hydrogen.

116. PROTECTIVE EQUIPMENT—Welsh Mfg. Co. 17-page booklet (catalog No. 55) catalogs protective equipment including weldor's goggles, hats, face shields.

117. PAINT STRIPPER — Oakite Products, Inc. Pocket-size booklet "How to Strip Paint" describes four methods: steam gun, hot flow-on, spray and tank.

118. STEEL TUBING—The Babcock & Wilcox Co. Bulletin TB-362 tells how resistance-welded carbon steel tubing may be used in number of applications.

119. ANTIWELD COATING — Acheson Colloids Co. Bulletin No. 425 describes use of "dag" colloidal dispersion as an antiweld coating for areas not to be bonded in welding operations

120. GENERATORS — International Fermont Machinery Co., Inc. 8-page manual "Engineered Kilowatts" (Bulletin 955) incorporates reference data, forms, check lists, in discussing internal-combustion-engine-powered electric generators.

Literature offered in this month's ads

125. Adjustable Clamp Co.—Catalog on two kinds of welding clamps.

126. Airline Welding & Engineering—Data and samples on fusion butt welds.

127. Air Reduction Sales Co. — Catalog 1318-WE is electrode guide.

128. Air Reduction Sales Co.—Catalog 9-131-WE on rods and fluxes for joining ferrous and non-ferrous metals.

129. Air Reduction Sales Co.—Data on "Aircomatic" wire package for automatic Tig and Mig welding.

130. Air Reduction Sales Co.—Complete information and detailed specification data covering the wide range of applications on the new automatic Tig head for long-run production welding.

131. Allen Co., Inc., L. B.—Information on soldering, brazing and welding fluxes.

132. Alloy Rods Co.—Information on welding T-1 steel with "Atom Arc T" electrodes.

133. All-State Welding Alloys Co., Inc.—"Buyers Guide" contains product solutions to metalworking problems.

134. American Brass Co.—Publication B-13 on braze welding.

135. American Manganese Steel Div.—Details on the "550" automatic welder and full line of "Amsco" hardfacing electrodes.

136. American Platinum Works, Inc.—Two reference manuals on low-temperature silver brazing and fluxing.

137. Ampco Metal, Inc.—Information on non-fuming, low-melting-point rod that permits both joining and overlay with oxy-acetylene process.

138. Anchor Metal Co., Inc. — Catalog, "How to Save Money and Do Better Joining with Your Complete Line of Solder Products."

139. Anti-Borax Compound Co., Inc.—Sample and booklet on case-hardening compound.

140. Arcos Corp.—Information on "Chromar" stainless coiled wire for submerged arc welding.

141. Arcos Corp.—Data on how to get welded security on the most critical jobs with stainless electrodes.

142. Aro Spot Welder Div.—Literature on portable spot welders.

143. Atlas Welding Accessories Co.—Details on weld-cleaning tools and other accessories.

144. Belden Mfg. Co.—Information on oil-resistant welding cable.

145. Bernard Welding Equip. Co.—Bulletins SS-3, MP-6 and PCB-6 on electrode holders, mechanical hands and contour cleaners.

147. Burdett Oxygen Co.—Catalog on "Burdox" welding, cutting and safety equipment.

148. Cam-Lok Div.—Catalog 131 on making your own waterproof, shockproof and Neoprene-insulated cable connections.

149. Carborundum Co.—Details on "Carboflex" cut-off wheels that cut through or pare with ease.

150. Carol Cable Div.—Information on "Dynapower" welding cable.

151. Cayuga Machine & Fabricating Co., Inc.—Information on automatic welding equipment.

152. Chicago Eye Shield Co.—Write for complete catalog on welding helmets and other safety products.

153. Chicago Hardware Foundry Co.—Booklet and prices on "Tank-Well" wrenches for acetylene tanks.

154. Contour Marker Corp.—Information and instruction book on laying out pipe joints.

155. Contour Marker Corp.—Details on establishing and marking a point at any angle.

156. Coyne Cylinder Co. — Specification sheet and price list on acetylene cylinders.

157. Cullen-Friestedt Co.—Bulletin WP26 detailing specific advantages of "C-F" positioners.

158. Detroit Testing Machine Co.—Catalog sheet and price on portable tensile tester for testing strip steel, wire bolts, spot welds, etc., within its 4,000 lb. capacity.

159. Dockson Corp.—Information on "Hi-Speed" welding and cutting torches for jobs from light plate to heavy castings.

160. Drawalloy Corp. — Information on precision hardfacing and welding wire.

161. Engwald Corp. — Application data on welding-fume exhausters.

162. Erico Products Co. — Catalog on "Caddy Type B" electrode holders.

163. Eutectic Welding Alloys Co.—Fact-packed "DirectoRod Guide," gives welding information.

164. Federal Machine & Welder Co.—Brochure describes welding press for resistance-welding applications.

165. Foote Mineral Co.—Information on supplying raw materials for welding-electrode coatings and steel additives.

166. General Cable Corp.—Details on how aluminum welding cable makes your job easier.

167. General Electric Co.—Information on three new power sources for automatic welding.

168. General Electric Co.—Information regarding "Fillerarc" automatic gas shielded welding.

170. Goldsmith Bros. Smelting & Refining Co.—"GB Data Book" gives complete information on low-temperature silver-brazing.

171. H & M Pipe Beveling Machine Co.—Information on pipe cutting and beveling machines.

172. Handy & Harman—Bulletin 20 on low-temperature silver brazing alloys.

173. Harnischfeger Corp. — Information on "P & H" welding positioners.

174. Harrisburg Steel Corp.—Send for literature and prices on high-pressure gas cylinders.

175. Harris Calorific Co.—Information on automatic oxyacetylene torches.

176. Haynes Stellite Co.—Form 8564, "Mechanized Hard-Facing," on process and available hardfacing equipment.

177. Hobart Bros. Co.—Information on "CV Powromatic" and heads for automatic welding.

178. Hobart Bros Co.—Send for latest "Simplified Arc Welder Catalog."

179. Hobart Bros. Co.—Information on complete line of arc-welding power sources, including a-c power/d-c welder combination and a-c and d-c welders, transformers and rectifiers.

180. Holger-Andreasen, Inc.—Information on "Andrex" portable X-ray for fast non-destructive inspection of welded metal structures.

181. Hossfeld Mfg. Co.—Bulletin shows bender models, standard and special dies, and illustrations of bends.

182. Independent Engr. Co., Inc.—Information on package-type oxygen-nitrogen generating plants.

183. International Nickel Co., Inc. — Booklet, "A Handy Guide to Welding Cast Iron with Ni-Rod and Ni-Rod 55," contains case histories, instructions, tips and technical data.

184. Invincible Vacuum Cleaner Mfg. Co. —Folder on welding flux recovery systems.

185. Jackson Products, Inc.—Details on how "Featherlight" electrode holders give trouble-free service and easy low-cost maintenance.

186. Kaiser Aluminum & Chemical Corp. —Informative folder, "New Advantages in Arc Welding with Aluminum Welding Cable."

187. Kedman Co.—Information on welding helmets, face shields and accessories.

188. Krembs & Co.—Flux chart and samples available.

189. Lepel High Frequency Labs., Inc.—Catalog contains information on high-frequency induction heating units for brazing, annealing, hardening, soldering and melting.

190. Lewis Welding & Engr. Corp.—Details on the "Universal" automatic welding fixture.

191. Lincoln Electric Co.—Bulletin SB-1351 gives specifications and procedures on the "Fleetweld 5-P„ for structural welding.

192. Linde Air Products Co.—Details on the two-stage "Purox" regulators.

193. Liquid Carbonic Corp.—Catalogs and prices on "Gasweld" torches and regulators.

194. Mallory & Co., Inc., P. R.—Resistance-welding catalog.

195. Metal & Thermit Corp.—Information on complete line of arc welding equipment.

196. Metal & Thermit Corp.—Details on non-destructive inspection equipment.

197. Metal & Thermit Corp.—Complete data on thermit welding equipment.

198. Metal Bond Mfg. Co.—Catalog on soldering and welding products.

199. Miller Electric Mfg. Co., Inc.—Details on the "SRH Low-boy" d-c rectifier welder.

200. National Carbide Co.—Write for name and address of nearest supplier.

201. National Cylinder Gas Co.—Illustrated portfolio of descriptive literature on complete line of "Sureweld" arc welders.

202. National Welding Equip. Co.—Illustrated brochure on oxygen and acetylene equipment and accessories.

(Continued on page 150)

WELDING INFO-AIDS

USE THIS CARD for Literature, Catalogs, and Bulletins shown on preceding pages and for those featured in this month's ads as listed opposite and on following page.

Also information about

NEW PRODUCTS described on pages 112 to 128

Every month WELDING ENGINEER lists many new catalogs and bulletins available from manufacturers. All are yours for the asking. However, this service is valuable to you only if you use it.

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★ For additional information on New Products described in this issue, circle the numbers and the items that interest you. The New Products section begins on page 112.

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ad literature

(Continued from page 148)

203. Norris-Thermador Corp. — Information and specifications on all sizes of acetylene cylinders.

204. Page Steel & Wire Div.—Folder DH-402 sets forth analyses of automatic welding wire.

205. Pandjiris Weldment Co.—Catalog on welding head manipulator.

206. Phoenix Products Co.—Information on "Dry-Rod" electrode ovens.

207. Picker X-Ray Corp.—Data on industrial radiography (X-Ray units for portable and mobile use, or stationary installation; Gamma sources, equipment and containers; and accessories).

208. Portomag, Inc.—Write for free "on-the-job" demonstration or literature on production tools with an electro-magnetic base.

209. Progressive Welder Sales Co.—Information on any type of special or standard portable spot-welding guns.

210. Rankin Mfg. Co.—Further details on hardfacing electrodes and rods.

211. Robotron Corp. — Information on timers and controls for resistance welding.

212. Ruemelin Mfg. Co.—Fume collector Bulletin No. 37E.

213. Sellstrom Mfg. Co.—Catalog No. 32 gives information and prices on helmets, respirators, goggles and other safeguards.

214. Shieldalloy Corp.—"Materials Specification Booklet," on materials for the welding-electrode manufacturer (powdered metals and alloys and processed minerals and ores).

215. Sight Feed Generator Co.—Details on "Rexarc Model RP-43" automatic welder and positioner for reguilding rollers, idlers and for fabrication welding on all circular shapes.

216. Smith Corp., A. O.—Details on how "C-O Manual" carbon-dioxide, hand-gun welding cuts time and gas costs and results in clean welds.

217. Smith Corp., A. O.—Information on complete line of a-c and d-c welders for every type of welding job.

218. Smith & Sons, Inc., G. W.—Data on how "Protect-O-Metal" spatter-proofing compounds make weld cleaning easier and improves your welds at the same time.

219. Smith Welding Equipment Corp.—Information on "Silver Star" cutting torch.

220. Square D Co.—Information on magnetic and electronic welder control for general-purpose machines and high-speed and precision welding.

221. Steel Sales Co.—Details on "Silvaloy" silver-brazing preforms for production brazing.

222. Stulz-Sickles Co.—Booklet on how to save time and money replacing worn tractor parts.

223. Sylvania Electric Products Inc.—Technical information on four types of tungsten electrodes for inert-gas weldings.

224. Taylor-Winfield Corp. — Data on standard and special "T-W" resistance welders and special arc-welding machines.

225. Tempil Corp.—Information on, and sample pellets of, temperature indicators.

226. Thomson Electric Welder Co.—Information on resistance welding equipment.

227. Tillman & Co., John—Catalog on weldors' gloves and garments.

228. Titan Metal Mfg. Co.—Complete information on bronze welding rods for repair and production welding.

229. Titanium Alloy Mfg. Co.—Information on "Ruflux" coatings for welding electrodes.

230. Tube Turns, Inc.—Details on welding fittings and flanges.

231. Tweco Products Co.—Catalog on aluminum welding cable.

232. Unique Equipment, Inc.—Catalog 54C on positioning equipment.

233. United States Steel Corp.—Complete information on simplified fabrication with "T-1" steel.

234. United Wire & Supply Corp.—Information on "Phoson" alloys for brazing copper and brass.

235. Vickers Elec. Div.—Complete information and literature on "Controlarc" d-c welder and other items of versatility, such as low-spatter performance on special electrodes, etc.

236. Victor Equip. Co.—Descriptive Bulletin 353 on accuracy and speed with which "Duplicutter" handles cuts.

237. Vogel Tool & Die Corp.—Details on how the "Arc-Twin" double notches pipe and tubing with each downstroke of punch press.

238. Wagner Mfg Co.—Descriptive literature and name of nearest distributor for "Hi-Amp" electrode holders.

239. Webb Corp.—Illustrated literature on complete line of tank-production machinery.

240. Weldit, Inc.—Data on the "Gas-aver," method of cutting production costs by automatically shutting off gas and oxygen intake lines when not in use.

241. Welduction Corp.—Data on new inert-gas, shielded-arc welding control.

242. Whitehead Metal Products Co.—Bulletin HH-5 on preformed rings and washers for silver brazing applications.

243. Worthington Corp.—Literature on packaged positioning equipment.

244. York Engineering Co.—Details on how "Spat-R-Pruf Compound 106" completely eliminates grindling after welding.

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226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250

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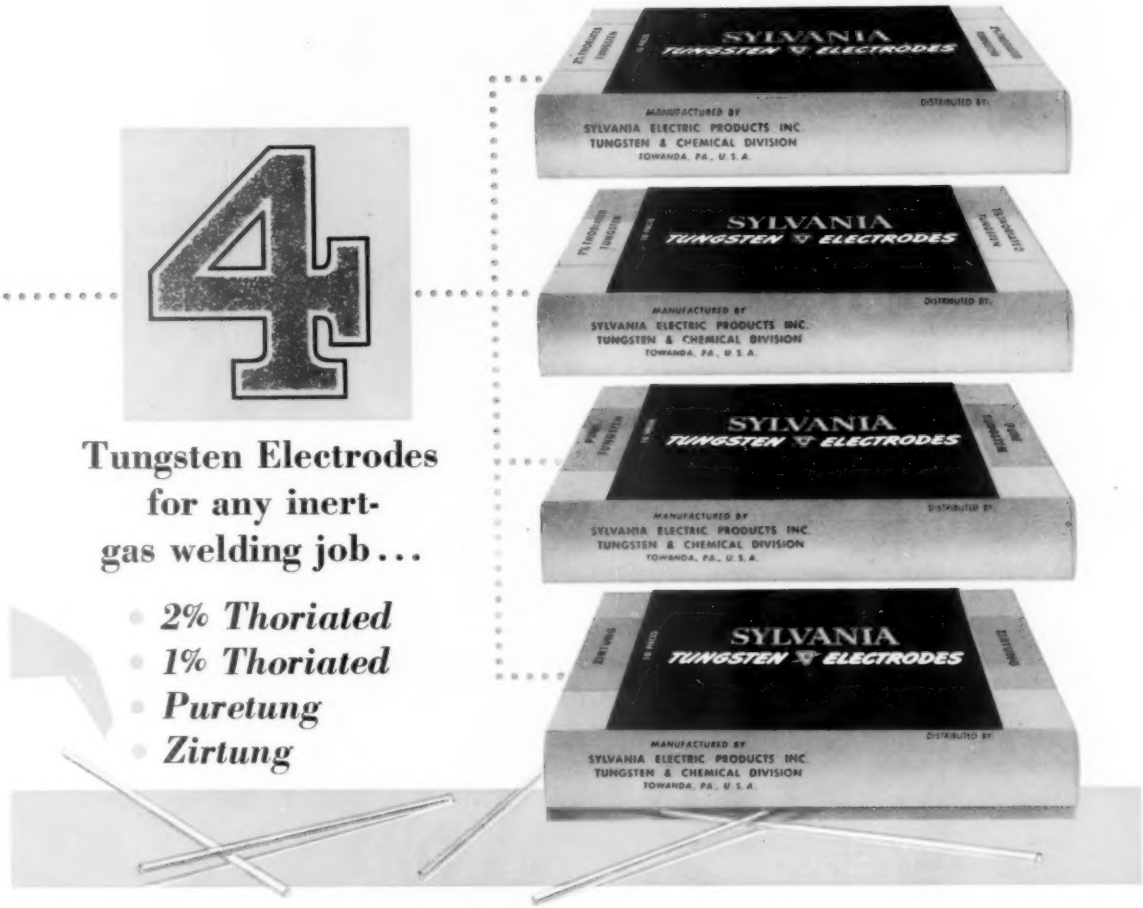

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